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SHEEP HUSBANDRY.

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PREFACE.

Harrisburg, Pa., June 15, 1905.

Sheep husbandry, in some parts of Pennsylvania, especially the southwest section, has been for years a very important industry.

With the large areas of land within the State, from which the timber has recently been removed, there is reason to believe that this important branch of stock raising may be pursued with profit in many places where in the past it has received but little attention.

Sheep, in a state of nature, are found in mountainous districts, and there is no place where in their domesticated condition they do so well as upon the hills or table-lands that overlook the lowlands and valleys.

Many of the mountains and hillsides in Pennsylvania from which the timber has in recent years been removed, are covered with rich grasses and other coarser forage-plants that make them ideal places for keeping sheep.

To encourage this industry and help such as may wish to engage in it to proceed intelligently in establishing and caring for their flocks, this bulletin is sent out by this Department in the hope that it may be the means of increasing the income of some of the land-owners of the State whose conditions are well adapted to sheep production.

N. B. CRITCHFIELD,
Secretary of Agriculture.

SHEEP HUSBANDRY.

BY MR. JOSEPH E. WING, *Mechanicsburg, Ohio.*

INTRODUCTION.

In all temperate lands where a high state of agriculture exists, especially among the older civilizations of the world, sheep play a very important part in the economy of the farm. They adapt themselves naturally to conditions of high priced land with constantly increasing need of fertilization, and indeed in many parts of England and France the high civilization and great degree of fertility existing in the rural regions are based primarily upon a system of sheep husbandry. Indeed there are large tracts of now very productive land in England where the only profitable agriculture is based upon a system of farming where sheep are the prime factors, not only for securing profits, but for maintaining and increasing fertility. It is almost incredible to one familiar only with American conditions, that such vast numbers of sheep can exist upon these arable English farms. The writer has stood upon one hill in Dorsetshire and counted about him eight shepherds, each with his flock of between 300 and 400 ewes and their lambs, each flock in hurdles, consuming green clovers, and it being May time, their great lusty lambs were near by in their own hurdled enclosures consuming the freshest clover (just penned off for them) and with their troughs of "cake and corn."

In Hampshire, too, the writer has seen on one 1,400 acre farm of thin soil based upon chalk, a flock of 2,500 magnificent Hampshire sheep, and of the 2,500 there were exact 2,500 healthy, profitable sheep. Surely there is a lesson to be learned somewhere here, for upon the average American farm it is difficult to find as many as 250 sheep in good health and profit, the main reason for the difference being the management used abroad and at home.

In France the writer has seen upon a great estate near Paris (belonging to M. Edm Delacour) a flock of about 2,000 of the Dishley merinos, kept there upon land worth probably twice what any agricultural land is worth in America, and of the 2,000 there seemed to be exactly 2,000 healthy, beautiful and profitable sheep. Now the climate of the region about Paris is much the same, one would suppose, as the climate about Philadelphia, being perhaps a trifle less warm in summer.

In the northern hills of England and Scotland, too, the writer has seen the flocks of Cheviots covering the mountain-sides and consuming almost the whole of the natural forage of the country, where they have been kept for centuries unnumbered. While a little farther north are seen the mixed flocks, the cross breeds, Border-

Leicesters and the Black-faced mountain sheep, thriving and producing a really great wealth in regions so rough, poor, cold and inhospitable that in our own land they would be given over to the wilderness, or what is worse, ruined by injudicious plowing, and the small amount of fertility they possessed washed away by our torrential rains.

The writer has been greatly impressed by the fact that in those rugged northern lands the sheep have done much more than to bring wealth into the country, seeing that they have developed there a race of sturdy, industrious, God-fearing, intelligent self-respecting men and women who send their sons and daughters in a steady stream to newer lands to form there the bone and sinew of the country. From between these heather clad hills and grassy slopes came many men who now form part of Pennsylvania's most valued citizenship, there being whole counties in certain parts of the State very strongly tinged with Scottish blood. There is, strangely enough, something about the art of shepherding and the care of sheep that makes men thoughtful, self-reliant and trustworthy, and this seems to have been so since the days when the angels chose the simple shepherds tending their flocks by night to receive the glad tidings of the birth into the world of a babe who was destined to bring to us all a new message and be Master among men.

Turning now to our own land, the writer regrets, after having made a study of conditions here for a quarter of a century that there seems to have been so little real serious, persistent effort made to build up a great sheep industry in his own country. There have been several obstacles in the way. First, in pioneer days sheep were kept roughly and with several motives. One that they consumed weeds and kept down brush. Then they gave a small supply of the much needed wool, and a little mutton to be eaten after the pork barrel ran low in late summer. There was not in the early days a universal liking for mutton, and in truth the writer distinctly remembers during his boyhood that among many people there was so violent a prejudice against the use of mutton that it was considered a direct insult to offer it to a guest without first inquiring whether he would eat it. It is a little difficult to account for this prejudice. It must have first come through ignorance of how properly to dress and prepare the mutton, since of recent years this prejudice has almost entirely disappeared, and in fact demand for mutton considerably exceeds the supply, especially the choicer grades.

A little later than the pioneer days there came the era of high priced wool, the introduction of merino blood and the growing of merinos in large numbers, with wool as the principal object. Considerable fortunes were built upon merino flocks when wool reached at times the price of 50c or even \$1.00 per pound. And following close after the days of unpopular mutton it was but natural that the breeders thought only of the fleeces they were growing, and bred a type of sheep producing the least mutton and the most wool possible. It seems a little presumptuous to assume that we are wiser than our fathers, but it was certainly a shortsighted policy that led them to neglect the bodies of their sheep, for it resulted in so much enfeeblement of constitution and loss of vitality in their flocks that they became ready prey to diseases. Parasites came; they always

do when there is neglect. Our fathers did not understand the internal parasite. They saw the symptom and thought the sheep had "Paper skin." The whiteness of the skin was merely the symptom of the disease, not the disease itself, but the result was then as now, that the afflicted sheep owners went out of business. There have been from that time until this, many spasmodic attempts at sheep husbandry in the United States. At one time the Cotswold was the favorite, and was hailed by expectant flock masters ever eagerly seeking something new, and hopeful of the "coming sheep." Later when the Cotswold proved not an unmixed good under indifferent management, the Southdown became the vogue, then the Shropshire, with here and there a local outbreak of Hampshire or Oxford, or Dorset, or Cheviot, and each breed has proven successful wherever given proper conditions, and all under incompetent management, have proved failures. There need seldom have been failures in management of sheep in our land. When failure came it was due in ninety-nine case out of a hundred to the plain inefficiency and carelessness of the men, who, owning sheep, were never shepherds. Two and two made four yesterday; two and two make four in England and two plus two make four in America. That is, given the observation of a few simple laws of management, those laws already determined by abundant experience, success with sheep is a matter of certainty almost as fixed as the mathematical proposition that two and two make four. Just now is an especially favorable time to embark seriously in the business of producing mutton, and incidentally, wool, upon the farm. The taste for mutton eating is growing with leaps and bounds in the United States. The price of well-fed lambs during recent years has steadily increased in spite of the very enormous increase of production. The price of wool has advanced also, though the writer would by no means present the argument that wool will yet further advance, or even certainly remain at its present high level. But there seems no likelihood that good mutton will ever again go begging for a buyer at profitable figures in the United States. For one thing, the increase in population in cities is very rapid, and with the increase of well-to-do families able to enjoy a good living, the consumption of mutton is proportionately greater than it was twenty years ago. At present by far the greatest source of supply of mutton in our land is from the ranges of the west, fed perhaps during winter somewhere in the corn belt regions, finished and sent on to eastern consumers. These ranges are being steadily diminished in area and productiveness, the settlers taking all of the best lands along the streams and in the valleys. So the lands left open to nomadic sheep herders are of the poorest and most meagerly grassed description. It is difficult to see how the western ranges can maintain their present numbers, and impossible to see how they can be increased.

Furthermore, the mutton produced on these ranges has ever been and will ever be of a comparatively inferior character. The range requires a tough, hardy, muscular, sinewy sheep, able to subsist for weeks at a time upon sage brush, pure air and mountain scenery. These sheep when well finished upon eastern corn and alfalfa, make the bulk of the mutton now in our market, but there is a large and rapidly growing class of consumers who know a better thing when

they see it, have the means and are willing to pay for it. Well-born, well grown and well ripened mutton from Pennsylvania farms when it is available in the market will command a premium over the western stuff, and justly so. There is another very attractive branch of the sheep industry that cannot be undertaken by the western man; partly because of his distance from the market; that is the business of supplying winter or hot-house lambs for the trade of large cities like New York, Philadelphia and Baltimore. These lambs born in the winter time consume little feed but much loving care and attention. Going to market they bring enormous prices in comparison with other meat products, and will repay the shepherd who has the skill to bring them forward in perfection.

It is with a sincere desire to help restore profitable sheep to Pennsylvania farms, that the writer has undertaken in this Bulletin to give the results of his own studies, observations and experiences. He can conceive of nothing more desirable than that many farms in every county of Pennsylvania should be devoted to sheep, and knows of no one thing that would bring greater blessing to the country; the gentle flocks bringing with them their own atmosphere of peacefulness and quiet, restoring the fertility of the soil, covering wide valleys and sloping hillsides again with luxuriant grasses and clovers re-building the fertility of the soil, restoring decaying homesteads and making firmer the foundations of even the prosperous ones. They would bring with them also a change in the inner life of the men themselves. With sheep and shepherding come stability of character and peace and content and willingness to abide upon the land; because they bring with them assurance of food and raiment for all, and profit to their fortunate owner. But yet it would be the least of the writer's desires to bring sheep into Pennsylvania before the owners thereof had prepared the way, by getting first into their heads some vital elementary truths concerning sheep, their requirements and necessities. Easy it is to keep sheep healthy and profitable as to keep a sweetheart or wife in love with you, and dependent upon much the same principle; the doing of little things, the right things at the right time and the right place. It requires no tremendous effort to keep a flock in good health and thrift, but it does require eternal vigilance, and more than in any other business it is the master's eye that prospers the flock. In England there is a class of professional shepherds whose fathers and grandfathers before them were shepherds upon the very land where they now dwell. These men through habit and inheritance know all the whims and mysteries of sheep life. They do not always know the reason for things, but they can tell you the results of practices good or bad. It is due to this watchful and loving care of these shepherds more than to any natural conditions that sheep thrive so well in England. A similar class of trained shepherds does not exist in America, and this fact alone is the greatest barrier to an immediate introduction of similar practices in America. It seems to be true here that the owner himself must be a shepherd. He may have his assistants, who will do the work under his direction, but success in its highest estate will come to him in proportion as he gives his personal attention to the flock, studies their needs, scents from afar the peculiar dangers to which they are subject, and believes in that good old principle that "A stitch in time saves nine."

The writer would particularly suggest to young men, or young women for that matter, the desirability of their taking up this work. It is difficult for an old man to change his practices, or to learn new ways. It is almost impossible for a man who has grown up caring for sheep in the careless and let-alone manner prevalent a century ago, to unlearn what he knows, and learn over again the whole business. There is a fascination and delight about the business when one takes it up when he is young. And while young heads and young hands may make many mistakes, yet young enthusiasm, young courage and brave young hearts will persevere and finally win out in the end despite the lack of experience at the beginning.

HISTORY.

No one knows the exact place from which came the wild sheep, progenitors of our modern breeds. There does not exist in all the world anything very closely allied to the sheep, yet there are several wild forms either of which may possibly have been the original. All of these inhabit mountainous and rocky regions. All are timid animals, feeding by night and keeping well out of sight of man. The nature of the domestic sheep shows it to have been descended from a mountain climbing animal, since its feet grow rapidly as would be necessary where they were subject to much wear upon a rocky soil. Sheep love the hills and love to climb. They choose the highest spots on which to sleep, a reversion to their primal instincts which led them to seek always the pinnacles from which they could witness the approach of any enemy. In a state of nature, therefore, sheep roamed wide, browsing among nutritious herbs and shrubs, eating grass and finding little, if any, grain. It is well to bear these facts in mind, as they are an indication of how best to treat the sheep in domestication to keep it in health and vigor. Doubtless the first sheep coming to America were of English origin, and although they are frequently spoken of as being "scrubs," yet it is really most improbable that anything deserving this term should have been brought across the water. "Scrubs" have not existed in England for many generations. Naturally the best would have been chosen for exportation. Sailing from the south of England from Bristol, or Plymouth, ships would naturally take on board sheep of the white-faced, long-wooled breeds there common, possibly of the Cotswold type or something like the Devon long wools might have been selected. In the mountains of Virginia and parts of Kentucky are found to-day some flocks of large white-faced sheep with horns, leggy and lank. They are not by any means beautiful, but esteemed as being great mothers and milkers, and when crossed with good sires make excellent mothers for spring lambs. These white-faced sheep, it seems to the writer, must be descendants of some old Dorset Horn or Somerset Horn sheep which may have come to Virginia in the early settlement of the country, and finding the mountains congenial homes have bred there ever since. Whatever the state of the English breeds may have been when they first reached our shores, doubtless neglect, scarcity of food and exposure to severe weather caused considerable deterioration. Indeed, the sheep is one of the most pliant of all creatures. It responds with wonderful quickness

to good care, and by selection, good qualities are readily fixed for a time; then if neglect follows, as rapid a deterioration sets in, and this fact should ever be borne in mind by the ambitious shepherd.

Merinos came to America much later than the English breeds, coming to us from Spain. Not until the beginning of the last century was any serious attempt made to establish Merino flocks in America. In 1809 and 1810 William Jarvis, of Vermont, imported 3,850 Merinos, of which 1,500 came to New York, 1,000 to Boston and the remainder to Philadelphia, Baltimore, Alexandria, Norfolk, etc. Soon after the introduction of Merinos, they caused the so-called "native sheep" or English breeds to suffer great neglect, principally because there was not yet any great demand for mutton, and wool commanded a high price. Throughout all the Eastern states, Merinos were in great repute, extending finally to the Middle West, and at last in comparatively recent years, to Texas, Colorado, Wyoming, Montana, California and all the great range states. Before the Merino came there was comparatively little real sheep farming practiced anywhere, and the advent of the Merino instead of developing an industry such as we need to-day, rather proved a hindrance, since the Merino, accustomed for centuries to sparse and frugal living, can exist under conditions not at all suitable for the English mutton breeds. The wide pasture covered with natural grass and set with thickets of hazel and other brush was often the home of the Merino flock winter and summer; in severe weather it is true, some artificial feeding might be given, perhaps corn stover drawn out upon the snow, or possibly unhusked corn. A straw stack was commonly provided and these patient little Merinos ate of it during the winter and scorned it not. If the sheep became thin in flesh during the winter, such was their wonderful vitality that they would pull through until green grass came, with very little help aside from what was provided in the grass, the brush, and browsing. Lambing under this old system of management was not usual until late in April or May, and coming after green grass was strong, the ewes had recovered sufficiently from their emaciation so that they were able to suckle their offspring fairly well, although it was not usually expected that an increase of 100 per cent. would be had. In the region of the writer's own home the owners of Merino flocks made small pretense of selling any mutton, in fact there was in his village a large establishment where great numbers of sheep were slaughtered in the fall, their pelts taken off and the carcasses boiled down to extract their tallow, after which the flesh was buried.

BREEDS.

THE MERINOS.

Undoubtedly one of the oldest races of sheep is the Merino, and most of all has this breed felt the influence of the hand of man, for farthest does this breed diverge from any possible wild type. In the Merino the result of centuries of selection has been a sheep with a fleece of extreme fineness and density, often accompanied with a great deal of oil or "yolk." It is evident that Merino

breeders have always, in selecting, considered excellencies of fleece, and have thus neglected to a great extent the building up of good form, in fact it is hardly conceivable that any wild breed should have had so poor and weak a form as many Merinos possess to-day.

Merinos came to us from Spain, though many importations of the larger types of Rambouillet and Delaine Merinos came from Spain by the way of France or Germany where they have been bred for many years, and it is most interesting to note how the different ideals of these people have resulted in widely divergent types. The French and German breeders finding mutton profitable, and having naturally an ideal tending toward the rugged and substantial, have evolved a much larger sheep than ever did the Spaniards, and for some purposes, a much more useful sheep for America. Merino wool is the finest produced in the world, and often commands the highest price. Breeders of sheep, however, in Pennsylvania must bear in mind that in production of wool they are competitors of the great ranges of the West, of the savage lands of Argentina and Patagonia and even far off Terra del Fuego, and have to compete with the whole continent of Australia, so that it is probable that the present high level of values for Merino wool are but temporary, although doubtless with the increase of mankind upon the earth, and the greater spread of luxury together with the steady shrinkage of wild ranges, there will be a steady appreciation in the general values of all wool.

The history of Merino breeding in the past is a fascinating one, and filled with valuable lessons that may be drawn from the mistakes of many early breeders. Fashion ruled with Merinos. At one time it was considered the right thing to strive for the largest possible fleece on the smallest permissible body. The result of this seemed at first to bring the greatest profit, for the breeders argued that all the feed consumed went to produce wool, forgetting that they were by this system undermining the constitution and vigor of their sheep, until finally their families of Merinos were so delicate that it was only by the kindest care and best nursing, that flocks were kept in existence at all. Again, other breeders steering a little way from this rock, conceived the idea that oil or "yolk" in the wool added greatly to the weight thereof, and the aim was to breed the sheep having the most oil in its wool. Now oil when in excess is a waste product of no value to the manufacturer, and only a burden to the unfortunate sheep that must carry it. And excessive oil, moreover, makes the sheep unable to withstand excessive cold, so that on the ranges it has been found that "greasy" sheep will freeze to death in cold winters. A manufacturer once told the writer of buying a fleece from a celebrated ram, which weighed 45 pounds unscoured. There may have been 18 or 20 months growth of this wool, but when scoured it yielded less than 12 pounds of scoured wool. Thus the farmer had wasted, and worse than wasted, feed enough to make 30 pounds of oil that he vainly hoped to sell at a high price to the manufacturer. Manufacturers, however, are not children, and perceiving that the scoured basis was the only one available to them, they learned to bid less and less for the heavy wool, so that the farmer probably profited nothing at all, excepting that possibly his brother farmer, so honest as to breed normal sheep,

may have taken a little less for his product than what it was worth, seeing that buyers often pay an "average price" throughout a neighborhood.

It would seem that we are wiser than our fathers, and that fads in Merino breeding have now mostly disappeared, since most breeders of Merino sheep to-day are seeking to produce a large, smooth sheep approaching as near as may be to the ideal brought forward by the breeders of purely "mutton sheep." There are not to-day so many folds or wrinkles as there formerly were, there is not quite the great percentage of wool that was then secured, but an advantage more than compensating, addition of vitality and stamina, and Merino breeding is probably on a sounder footing than ever before in its history. The importance of the Merino breed will be appreciated when it is remembered that there are in the United States probably 20,000,000 or more of sheep of Merino foundation. All through the range country Merinos are found; no sheep can take its place there. Merinos are hardy, of long life, able to subsist on sparse vegetation, and to go for long periods with no food at all if necessary and yet retain the vital spark of life. However, it is no longer believed, even on the ranges, that flocks should be of purely Merino blood, it being recognized there that an infusion of from 25 per cent. to 50 per cent. of good "mutton" blood makes a far stronger sheep, a better mother and milker, and able to produce much stronger lambs, that sell at a higher price in the market place. On eastern farms the place of the "Merino" is as mother of winter lambs. For this purpose she will be the better if she herself has an infusion of mutton blood, say that her sire was a Shropshire, a Dorset Horn, or Southdown, and her dam any sort of Merino, the larger the better. The peculiar ability of the Merino to bring forth lambs at an early season gives her a distinct advantage over ewes of the English breeds for this industry. Another place for the Merino, which it will do for no other sheep to fill, while the present generation of men exists, is upon the farm of a "let-alone" and careless sheep farmer, for no English breed can endure as much lack of care and scant feeding in winter as the Merino. There is a belief also that Merino sheep suffer less from internal parasites than the English breeds. Rather, the writer believes from observation, that Merinos suffer quite as much as any, but having usually the appearance of dejection, a little added grief is not so noticeable. There is no doubt that the mutton breeds die quicker when attacked by parasites than Merinos, but they, as well as English breeds, should be kept healthy if they are to return the largest profit.

TYPES OF MERINOS.

As before mentioned, Merinos vary greatly according to the individual fancies of their breeders. They are divided in a general way into the American or Spanish Merino class, those being the smallest in size and the heaviest shearing proportionately of all Merinos; the Delaines, a class of larger sheep with heavier bodies, fewer or no wrinkles, fairly good mutton forms and a peculiar quality of wool called a "Delaine," or combing wool. Delaines vary greatly in their characteristics according to the fancies of their breeders, and there is in them a considerable admixture of various

Merino families, in some of them the blood of the Rambouillet has been introduced with advantage so far as size is concerned. The Black Tops are similar to the Delaines, but having more oil in their wool, the dust adheres to the outer ends of the wool fibers and gives the dark appearance, from whence comes their name. The Rambouillet or French Merino is the largest of the tribe, and indeed some individual specimens of the Rambouillets have been among the largest of all sheep, weights having been recorded as great as 400 pounds, and fleeces as heavy as 60 pounds. These, however, are entirely exceptional, and it is doubtful if ever any sheep in the world yielded as much as 60 pounds or even 40 pounds of fairly clean wool in one year's growth. The Rambouillet has had rather a remarkable history in the United States. Early introduced it was found "not hardy" and was quite generally condemned and discarded. The fact is, its lack of hardiness was more an inability to withstand starvation than anything else. If given food, there is no hardier sheep than the Rambouillet. However, a few admirers of these great sheep having sufficient food for them, retained their flocks and bred them pure for many years. There are among the writer's neighbors to-day some flocks that were founded more than fifty years ago, that have remained continuously upon the same farms ever since; proof that American soil and conditions make a congenial home for the Rambouillet. Some fifteen years ago the Rambouillet came again into notice and achieved a sudden and remarkable popularity when it was discovered there existed in America quite a good many flocks of really very creditable sheep of this breed. They enjoyed a decided "boom" for ten or a dozen years, and are at present in good demand, although not selling for the high prices that they did a few years back; the reason for this, however, being that very large flocks of Rambouillets are now kept upon many favorably situated western ranches, notably in Utah, California, Oregon and Montana, which supply Rambouillet rams to the ranch trade by thousands. The Rambouillet makes considerable claim to being a mutton sheep as well as a producer of very good Merino wool. It is not, however, to be compared as a mutton producer with the best of the English breeds, although on many farms and under many conditions there is no question that the Rambouillet is one of the most profitable sheep that can be kept in Pennsylvania and similarly situated Eastern states. The great value of Rambouillet blood on eastern farms, however, aside from the possible selling of rams to western buyers, lies in the superb quality of motherhood possessed by Rambouillet ewes. There is hardly any better mother among sheep, and if she be mated with a proper ram, for instance, with the Dorset Horn, Shropshire or Southdown, the lambs will be born very early, nourished very abundantly, will fatten readily, be beauties when ripe and sell for the top price. Perhaps the ideal ewe for an eastern farm is a cross bred ewe, born from a Rambouillet mother and a Dorset Horn or Shropshire sire. Such ewes are very hardy, prolific, healthy, good shearing, long lived and generally satisfactory farm sheep. The Rambouillet, however, gets its great size from having been well-fed for many generations. It has digestion and power to use a large amount of food, and upon a starvation diet, becomes scrawny, hump-backed and ill-favored. (See Fig. 1.)



Fig. 1. Rambouillet Rams.

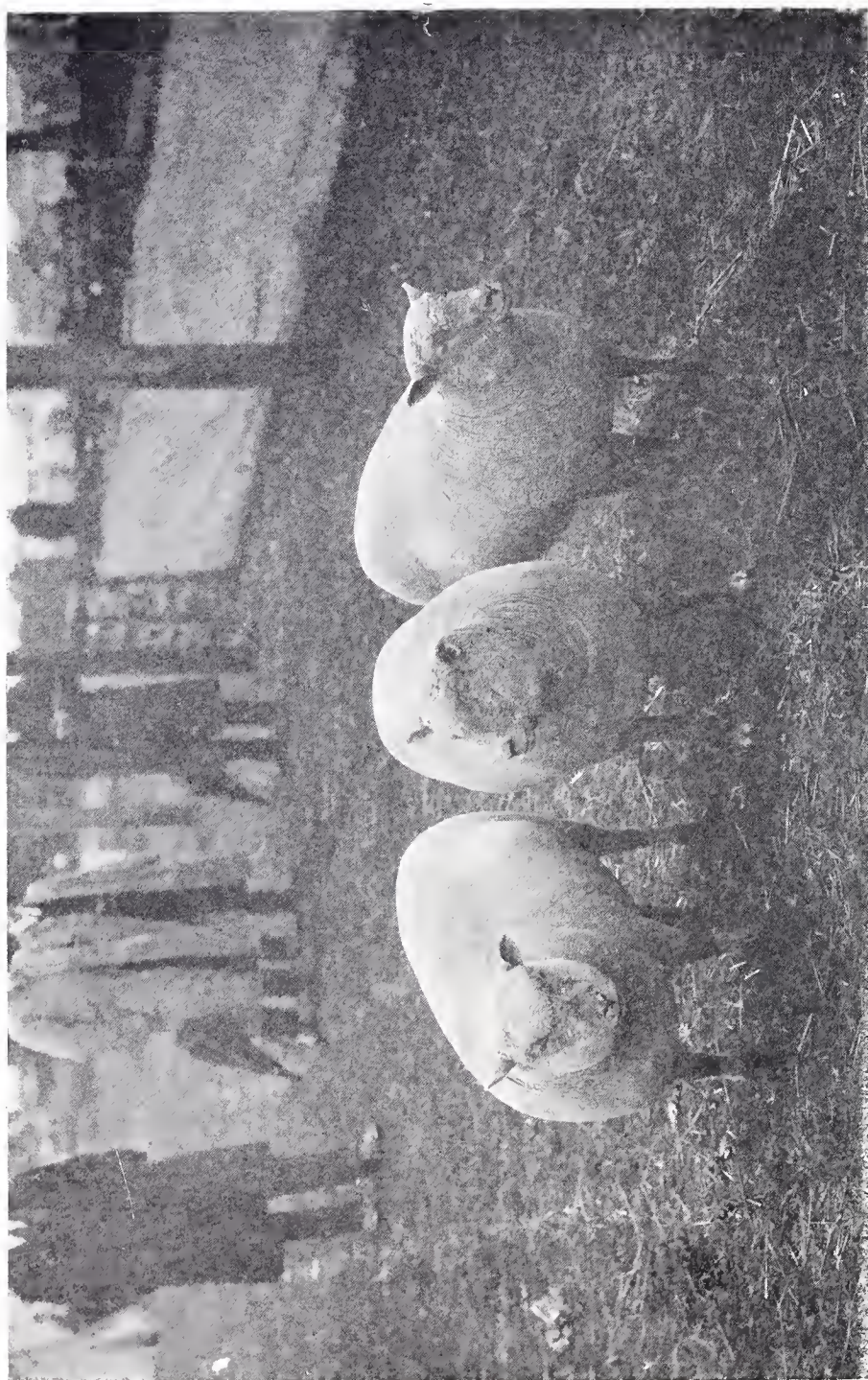


Fig. 2. Southdowns in Perfect Fitting.

While the writer would by no means venture to advise as to the choice of breeds, yet he feels certain that the prospective shepherd in casting about for a type of sheep to put upon his farm will be pleased with the results from any of the larger Merinos, if he will choose those devoid of wrinkles, without too much grease in the wool, with as good mutton forms as he can find, and will breed the ewes to good sires of some suitable mutton breed. He will not reach quite the great degree of success possible to achieve with sheep purely of the mutton grades, but on the other hand his system of management need not be quite so good, his care may relax in some slight degree, and several troubles that may overtake him in first experimenting with English breeds, he may escape.

THE ENGLISH BREEDS.

It is a curious fact that nearly all of our improved breeds of live stock, Merino sheep, Holstein cattle and certain horses excepted, come from England. Englishmen are great builders. They love to build solid, and strong and square, and their breeds of cattle and of sheep partake of the quality of their houses. Their eye for form is, to our notion, better than that of any other race, and in sheep breeding especially they have carried the perfection of form farther than any other people. The English are a race especially fitted to be good sheep breeders and shepherds, careful, studious, patient, not stingy of hand in feeding, and possess an innate love of animal life and of perfection of form. In England, too, the "higher classes" of educated people are distinguished for their interest in out of door things, and especially in animal life, so that they enthusiastically give thought and effort toward perfecting races of animals. There is a singular profusion of breeds in England. Almost every county has its well recognized local breed, and sometimes two or three minor breeds will be found within the same confines, nearly all of these breeds having their own individual points of excellence, being especially suited to their environments, and several of them have been brought to our shores with profit. Undoubtedly there are breeds in England that have never been introduced here, that would prove profitable under our conditions, although we can get along very well under most any conditions with those that are already imported. In truth, even in England there is a steady tendency toward greater restriction of area devoted to some of the minor breeds, and a continual advancement in some of the more important ones, so that in the course of time, some of the minor breeds in England will be kept more as curiosities than as being desirable for their own sake. It is difficult to say whether natural conditions of environment or varying phases of mental make-up in the sheep breeders themselves have contributed most toward the separation of types in England, it is a very curious study, and one impossible of solution, yet it seems true that certain soils naturally produce certain types of sheep. In the south of England there is a great stretch of upland based upon chalk, having a thin but quite fertile soil, bearing short but sweet and nutritious grasses. This region is called the "Down" country. These hills are "downs," the sheep evolved upon these downs are the South Downs, Hampshire Downs, and Suffolk Downs, and from these breeds, by blending their blood with that of other breeds, the Shropshire Down and Oxford Down. These

"Down" races of sheep are well adapted to making excellent mutton from grass alone. Their lambs are among the most thrifty, early-maturing and profitable. They are all built much alike, the model for all being the South Downs, with straight backs, well sprung ribs, short sturdy legs and broad breasts. Each breed has brown or black faces and legs, and these dark points on the lambs make them especially attractive in the market place. The "Downs" are the most popular of the English breeds in America, and except for special purposes, the most profitable. They have the advantage over the long wools (Leicester, Costwold and Lincoln) of earlier maturing, with less weight when fat (our market requiring small lambs quite fat), and being beside somewhat better adapted to our climate in summer. They have the advantage over the Merino in being much more easily fattened, and produce mutton which sells usually at a higher price; and over the Dorset Horn, when lambs are to be kept to the age of eight to twelve months. The Dorset Horn on the other hand excels the Downs in ability to drop its lambs very early in the year and fatten them at an extremely infant age while suckling their mothers.

THE SOUTHDOWN.

One of the oldest of the pure breeds of England is the Southdown. In form the Southdown is one of the most perfect sheep in existence. The beauty of the Southdown is proverbial, "As good as a Southdown" being a term applied by other breeders to a sheep. (See Fig. 2.) The Southdown is one of the smaller English breeds, although the sheep are so thick and short-legged and full-fleshed, that when put upon the scales their weight often astonishes one not acquainted with the breed. Southdowns have grey or brown faces, ears and legs (sometimes black), small erect ears, a very bright and elert appearance and quick way about them, and a very bright eye. There is no breed with more vigor or general hardiness than the Southdown. They are great rustlers after grass, and will keep fat if there is any food to be had upon the farm. They breed well, twins being quite common, although not dropping their lambs so early as some other breeds, however, the lambs grow very rapidly and soon attain to good weights. For cross breeding the Southdown sire is one of the best to be had, having great prepotency and ability to stamp his likeness upon his get. Southdowns have good feet, seldom requiring trimming and are not subject to foot rot. Their one disadvantage for our conditions would seem to be the comparatively light fleeces that they shear, being excelled in this respect by the Shropshire a sheep having many of the same characteristics without quite the same hardiness and perfection of form. The writer has never known a Southdown breeder, upon suitable soil, who became dissatisfied with his choice of breed. It is known as "the gentleman's sheep." It is the favorite to put into parks, it furnishes the choicest mutton to be had and mutton selling for the highest price.

THE SHROPSHIRE.

While the Southdown is, so far as we know, distinctly a pure breed of unmixed ancestry, the Shropshire has the advantage of being a built-up breed, that is, it has in it a mixture of bloods, of

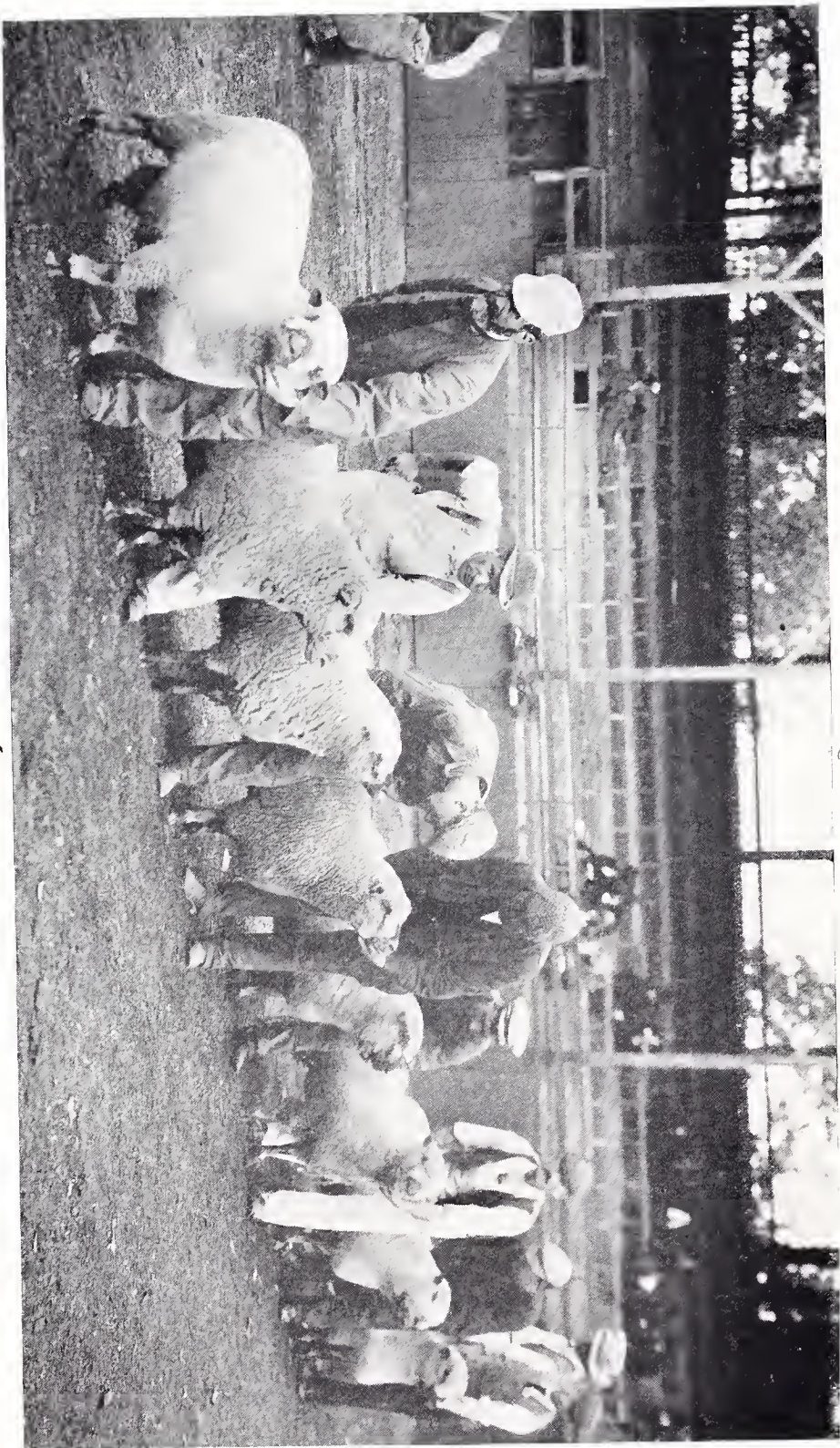


Fig. 3. Types of Shropshire Rams.

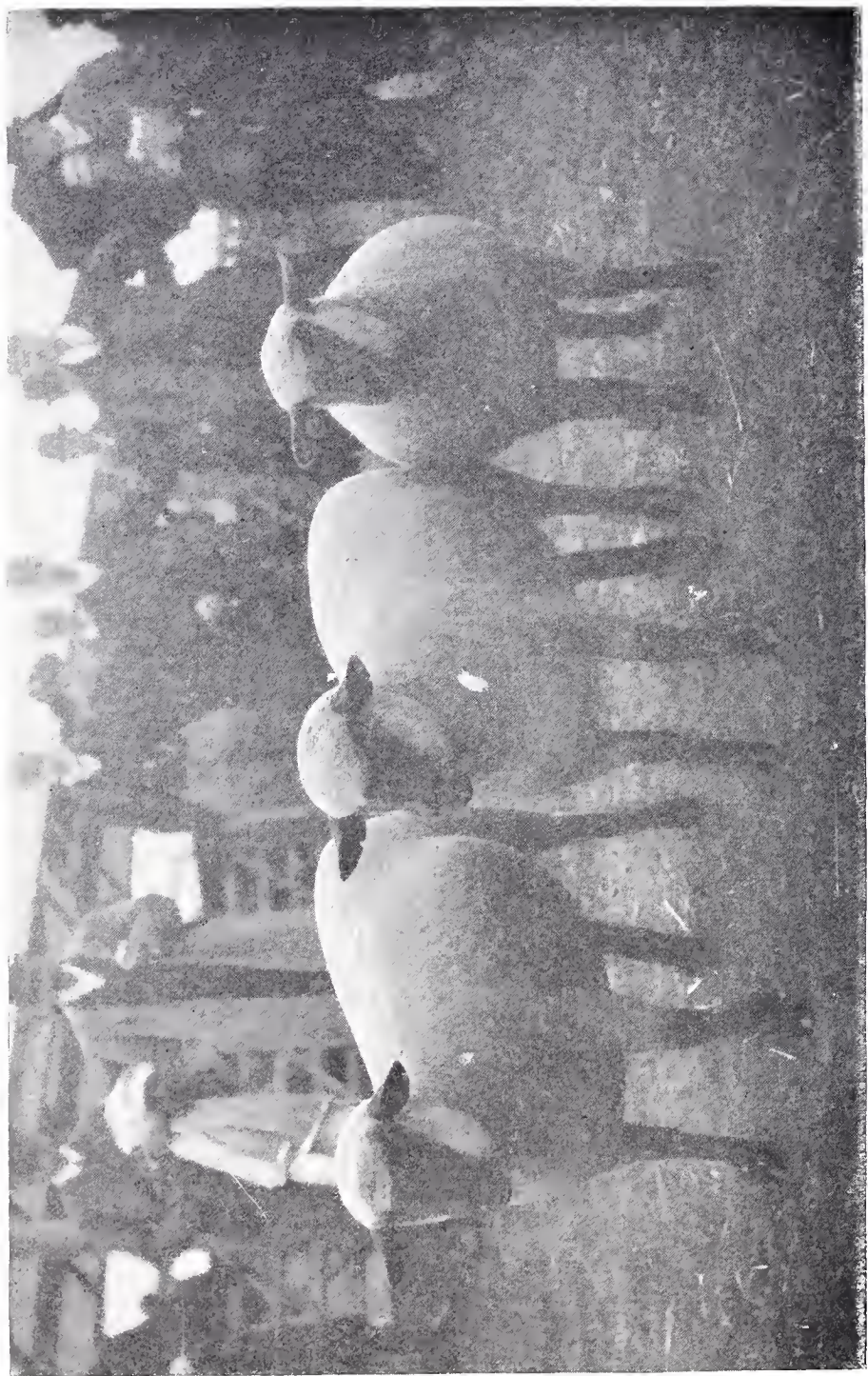


Fig. 4. Some Hampshire Ewes.

Southdown, Leicester, Cotswold and an old breed called Morfe Common. These old Morfe Common sheep were a small race with black, or brown or spotted faces, carrying horns. However, it seems unnecessary to consider much the part that this starting point had in forming the modern Shropshire breed, seeing that in the selection of about one hundred years, the characteristics inherited from their better ancestors have been retained, and yet it is interesting to note that occasionally a remnant of horn is discoverable upon an even well-bred Shropshire sheep, showing unmistakably nature's law of occasional reversion to type. Outside the Merino classes the Shropshire is undoubtedly the most popular sheep in the world to-day. Let us briefly recount some of the reasons of this popularity. It has a form not very unlike that of the Southdown, with a little added size. Its brownish black points are as beautiful as the Southdowns, and perhaps a little more so, its fleece is longer, almost as dense, and more completely distributed over the sheep, covering in fact in a well-bred specimen, the whole body, excepting the point of the nose, and the front legs below the knees. In truth, the well-bred Shropshire sheep is a wonderful example of what man can do in building animal form toward an ideal, for even the most skilled and advanced breeders find it difficult to suggest any additional improvement or characteristic that can be given to the Shropshire. Shropshires are probably about as prolific as the Southdowns, will usually drop their lambs a little earlier, are nearly as good mothers, and when kept in health (which means kept free from parasites), are very profitable on any arable farm. They do not keep fat quite so easily as Southdowns, but on the other hand are not nearly so liable to become too fat for breeding purposes. The popularity of the Shropshire is attested by the fact that the American Shropshire Association is the largest on record in the world. Shropshire rams of a vigorous type make excellent sires for cross-breeding, and with Merino ewes bring very beautiful and profitable lambs.

HAMPSHIRE DOWNS.

There is a class of men who are satisfied with nothing short of the best of things. They do not object to taking pains, and incurring trouble and expense, if they can achieve the best results. To this class, I commend the study of the Hampshire Down sheep. (See. Fig. 4.) Certain it is that of all the races none will give more satisfactory results, if given feeding, care and skilled shepherding than these Hampshire Downs. The writer has seen them in their glory in England, and certainly nothing is more fascinating than to study a business flock of Hampshire ewes and their lambs. The great motherly, tranquil ewes, pictures of health and content, the wonderful lambs, so big and sturdy and well developed that one unacquainted with them would think them much older than they are, and tales of profits from these well kept flocks are very fascinating indeed. The Hampshire breed is another of the made-up breeds, containing blood of the old Wiltshire, Southdown, Cotswold and Leicester. This mingling of bloods of course was done many years ago, so that sixty years ago the breed was well established, and for so long has it been bred purely within itself that it now possesses as great prepotency as any of the Downs. The Hampshire is a

large breed, perhaps the largest of the Downs, rivaling the Oxford Downs in this respect. It has a rather short, thick set fleece of firm elastic wool and quite black points, the nose in the ram should be thick and bold, and the ewe herself carries a bold head, but with a more feminine character. The lips are black as are also the nostrils, and eyes of rich yellow brown and large. The ears are long, and in the best types fall slightly outward, giving the idea of great width of poll. They are thin and mobile and are set forward when the animal is in the attitude of attention, giving an idea of intelligence and liveliness. The neck is thick and muscular, and is considered a point of considerable excellence and importance. The fleece is composed of exceedingly fine fibers and is thick on the skin which is pink in color. In its native land the Hampshire lives mostly between hurdles, feeding off crops sown especially for their use, and by the aid of hurdles or portable fences are given fresh grazing every day, the lambs going "forward," and the ewes following and eating on the second day what the lambs picked over the first. "So accustomed are they to this method that when turned out they usually move about in mobs, often grazing in a semi-circle, the foremost being in the center of the curve. The number of sheep which are maintained upon Wiltshire and Hampshire farms is extraordinary. We have for example, on the College Farm at Downton, lambed down 550 ewes on 600 acres in a recent season, as well as having maintained 200 tegs. The summer stock, when the lambing season proved to be very favorable, has consisted of about 1,250 to 1,300 sheep and lambs, besides a dairy of 30 cows and young stock in proportion."—Wrightson.

It will be seen by the foregoing to what extraordinary length the development of sheep farming has gone in England, and that there are no better examples of how the best things are done than are to be found among these Hampshire breeders. The writer knows of no reason why Pennsylvania farmers given an equal amount of experience, should not on their farms accomplish results equally noteworthy. True, we have not quite the high level of prices in our markets that the Englishmen enjoy, but we own our own land, and support no "nobility" by payments of large rentals. It must be remembered, however, that the Hampshire has for so many years been the recipient of kindness and generous feeding that it is by no means able now to shift for itself on meager pickings, and indeed when neglected, full of parasites, or semi-starvation, it presents the sorriest spectacle of any of the English breeds. The massive bone characteristic of the breed, the large heads and general liberality of framework seem altogether in keeping when it is in good flesh, but when enduring the pangs of starvation or disease, it is indeed a spectacle to make angels weep.

THE OXFORD DOWNS.

Appearing a little later than the Hampshire Down came the Oxford Down, born of union between the races of Hampshire and Cotswold, a curious illustration of the truth that men are never satisfied and seek ever to combine excellencies of one race with those of another. (See Fig. 5.) However, we are the richer for the enterprise of the British breeders who have produced the Oxford Down sheep.



Fig. 5. The Oxford Type. Rams at the St. Louis Exposition.



Fig. 6. A Group of Dorset Ewes.

What has been said of the Hampshire Down may almost be said over again of the Oxford Down, its characteristics being much like that of the Hampshire, saving that the fleece is longer, partaking somewhat of the nature of the Cotswold, and the lambs have not quite the early maturity of the Hampshire Downs. Oxford Downs when kept in health are very profitable sheep in America as at home, and Oxford rams are often used in Scotland for crossing upon the mixed Cheviot and Border Leicester ewes. They have been used in our own country with good results for cross breeding. Oxford Downs thrive particularly well in a cool location, and in Pennsylvania their best habitat would be upon the higher altitude of the mountains, provided there could be given them sufficient rich forage, as it is not a sheep for scant picking, and will hardly prove as profitable on thin pastures as the smaller "Downs." But upon any generous farm, when properly managed and kept in health, the Oxfordshire Down will prove profitable and satisfactory. The appearance of the Oxford is, to the casual observer, much as though it were a very large Shropshire, but upon close examination, of a very different character, as is shown. The fleece is coarser and longer and not so thick set upon the skin, the bone heavier and the covering about the head not so complete.

THE SUFFOLK DOWNS.

The Suffolk Down is one of the few survivors of the old county breeds of "Down" sheep which inhabit the chalk hills of southern England. Only the Suffolk Down and Southdown have remained unmixed and "unimproved" by other blood. In England the Suffolks are quite highly esteemed, particularly since their lambs have of late quite often commanded the top prices in the Smithfield market, and now and then won distinguished honor at the royal show. Rather better growth has been secured on these Suffolk lambs than from any other of the "Down" breeds, and the mutton sells extremely well. The appearance of the Suffolk is attractive, although to the writer, the other "Downs" are rather more beautiful. The face and legs are extremely black, there is little wool upon the head or between the ears and there is usually a little greater length of leg than with some other "Downs." After all, "Handsome is as handsome does," and in this respect the Suffolk breed undoubtedly bred for utility when other "Downs" were being bred for fancy points, has led the procession. The Suffolk, like the Hampshire, is a sheep demanding and deserving the best methods and care, and not at all to be recommended to the man who wishes an animal capable of "roughing" it and picking a scanty living from insufficient pastures.

THE DORSET HORN.

It is with some hesitation that the writer approaches the subject of the Dorset Horn, or the Dorset as it is commonly termed in America, seeing that he has so long been an ardent admirer of this breed, which causes him to fear that he may err by giving undue prominence to his favorites. (See Fig. 6.) With this caution to the reader, however, we will proceed to consider this, one of the oldest British breeds. In the south-west of England lies the county of Dorset-

shire and adjacent county of Somerset. Very fertile these counties are, beautifully diversified by hill and valley, covered with lovely farms and homesteads, set thick with tiny villages, but without any notable cities. The soil of Dorset varies from a thin chalk upon the Downs to a rich clay loam. The climate is very mild, owing to its location and proximity to the sea. For many centuries this has been a land inhabited by farming people, a land prized and jealously guarded, as has been proven by the remnants of ancient earthworks built before the days of the Romans. Centuries ago, before cows were much used in dairies in Dorsetshire, it is said that sheep were the commoner dairy animals and from this beginning probably came the Dorset Horn of to-day, with its wonderful milking powers, its great fecundity and its ability to yearn at any season. The original Dorset sheep was a large, rather coarse, long-legged breed, with both sexes having horns, not very comely to the eye, but having wonderful powers of maternity before mentioned. It is a curious fact that both sexes of Dorsets have horns, and so far as we know, have always had horns, seeming to point to a primal origin quite different from that of some other English breeds. All efforts to improve the Dorset sheep by mingling the blood of other races, have proved unsuccessful, so that improvement has been made strictly within the breed. Within the last twenty-five years great change has been made in the Dorset sheep. Without dwelling at length upon points of form, which in the main should be the same in all breeds, the ideal of which all breeders hold in common, it may be said that the Dorset of to-day has much the form of the Southdown, with added size. There is, however, a little less symmetry, especially about the back, with generally a larger pelvic development and more udder. The faces are pure white and there may be a little wool upon the forehead, although original Dorset Horns were bare about the head. The horns of the rams are very large and curve spirally forward, so that they appear as though looking through a pair of enormous spectacles. The ewes' horns are much lighter and curve forward and inward, rather in front of the eyes. Dorset rams should possess every appearance of masculine vigor, with large bone and moderately short, strong legs. The horns of the Dorset are not so much of a superfluity as are horns upon cattle, seeing that the mental qualities of the Dorset sheep inclines it to be pugnacious, and to stand its own when strange dogs come about, even perhaps to take the aggressive and drive intruders from the field. This trait is especially marked when the ewe has a young lamb, and even the collie well known to the flock, finds it prudent to then give the ewes a wide berth. This trait of the Dorset has led to their being extensively advertised as "dog proof," which they are not, of course. Dogs can, and will, kill Dorsets if they are already trained sheep killers, but the Dorsets put up a very hard fight before surrendering, and it is certain that dogs would never learn sheep killing upon a Dorset flock. The wool of the Dorset sheep is quite thick, rather fine, very white and elastic, so that when well fitted specimens are clipped into shape for the fall shows, they present a very even surface, and the hand pressed upon the wool leaves no imprint. Well-bred Dorsets shear about with the Shropshires, hardly heavier, and the wool commands as good a price as any of the English breeds. But the distinguishing characteristic



Fig. 7. Type of Dorset Rams.



Fig. 8. Cheviots.

of the Dorset, the one thing that has caused it to be perpetuated as a race and hold its own against all comers, even to quite largely displace other breeds in parts of England and our own country, is the ability of the Dorset ewes to conceive and drop their lambs at an early season, and by their great milking powers to push them rapidly forward to very early maturity. In England it is not uncommon to have Dorset Horns on Smithfield market at Christmas time, when they bring long prices. They will, if properly treated, lamb in September, and from that time onward until spring, although well managed Dorset flocks seldom yearn at a later season than February. Dorsets will, if not restrained, drop two crops of lambs in a year. This, however, is not a good practice, and is not permitted by practical shepherds, seeing that one crop would be born out of season and the next one injured by reason of the drain upon the ewe in nourishing the untimely lamb. It is found more profitable to rear one lamb crop at the right time than two. Dorsets in America have one proud distinction; their breeders here have been able to breed as high a class of sheep as have been produced in England, if not better, whereas among the Down breeders it has been found necessary to make frequent importations to maintain flocks in the highest excellence. This has not been found necessary with Dorsets. The Dorset has been a favorite breed in America among producers of "hot house" lambs. Both Dorset rams for cross breeding have been used and Dorset ewes coupled with Dorset Rams, and what is probably best of all, the grade Dorset ewe coupled with a good "Down" ram, this last producing undoubtedly the winter or "hot house" lambs of the greatest possible merit. (See Fig. 7.) Dorsets have proved hardy in Pennsylvania, and in fact nearly all over the Union, and have been profitable wherever tried, providing the management has been sufficiently careful to keep them free from internal parasites. It is not probable that they are more subject to these destroyers than the "Downs" or other English breeds, nor is it especially difficult to prevent the ravages of these pests, but unless the required amount of care and forethought can be given, no man should attempt to breed Dorsets, or any other of the English breeds. Dorsets for cross breeding have proved extremely valuable. The use of the Dorset ram upon Merino ewes has given cross bred ewes, that rival in point of general utility, the pure bred Dorset themselves. In fact with the ordinary shepherd the cross bred ewe of this cross will prove more profitable in the market flock than the pure bred Dorset herself, being nearly as good mothers, yearning quite as early, shearing well, and being a more sure breeder than the pure bred Dorsets under American conditions. In fact ewes of this cross have proved, in the writer's experience, the most profitable sheep he has ever had to do with. The objections to the Dorset Horn as a sheep for the general farm are, first, the horns upon the rams, which sometimes give trouble, then the fact that the rams, if not fed off at an early age develop a horn that is somewhat objectionable in the market, and next that Dorset lambs fed to an age of ten months will often attain a weight of 165 pounds or more, which is entirely beyond the requirements of the market of to-day. So that the Dorset is placed by its nature and adaptation closely within the field of the producer, for very young fat lambs preferably at an early season.

THE CHEVIOT.

Somewhat resembling the Dorset in conformation, although without horns and with a different head is the Cheviot (See Fig. 8.), a sheep coming from the mountains of Northern England and Southern Scotland. A very ancient breed is the Cheviot and one of great merit and of especial adaptation to the conditions of many parts of Pennsylvania. Long accustomed to making flesh from grass alone, the Cheviot is one of the best of the grazing breeds. It is beside very active, industrious and hardy, willing to climb rugged mountain sides in search of grass, and not so choice as some sheep as to the character of grazing. The Cheviot is a very beautiful and picturesque sheep, having about it something of the air of a wild thing, with its bright eyes, its erect ears and alert manner. They abound in vitality and constitution, and given fairly good opportunity, make very profitable returns to their owners. Cheviots thus far have been little tried as early lamb producers, and it is not probable that they would readily forsake their habit of lambing upon grass, but for stocking mountain pastures from which fat lambs are to be sold in autumn, hardly any breed could be chosen with more confident expectations of success than the Cheviot. In America, Cheviots have given a good account of themselves wherever tried and their shepherds are enthusiastic in their praise of their beautiful charges.

THE LONG WOOLS.

Of the long-wooled breeds, the Leicester, Cotswold, Lincoln and Kentish or Romney Marsh sheep are especially worthy of study. The Leicester is indeed one of the first of English breeds to have felt the impression of great improvers of live stock, seeing that it is a matter of history how Robert Bakewell began the improvement of this breed more than a hundred and fifty years ago. The story of Bakewell's achievements reads like a romance. Taking an old, long-legged, lank, slow feeding type, he was able in a comparatively few years to produce from it by deft selection of sires and skillful matings, and aided no doubt, by judicious inbreeding, to produce an "improved" sheep, somewhat less than the original type, but more symmetrical, thicker, deeper and possessed of greater fattening properties as well as early maturity. His success as a sheep breeder is best indicated by the appreciation in which his animals were held. From a few shillings per head, (it is stated that his first rams offered for letting, only made 17 shillings 6 pence each), the price rose to 100 guineas, and in 1786 he made 1,000 guineas by the letting of his stock. In 1789 he made 1,200 guineas by the letting of three rams. The Leicester sheep, as bequeathed to us by Bakewell, may be described as a white-faced, hornless race, covered with a fleece shearing about 7 or 8 inches in length, of somewhat lashy wool and terminated with a short twisted curl. The lips and nostrils are black, nose slightly narrow and Roman, but the general form of the face wedge-shaped, and covered with short white hairs. The forehead may have a top knot of wool, ears are thin and long, the neck is short and level with the back, thick and tapering from skull to shoulders. There is great thickness "through the heart." They are well filled up behind the shoulders, giving a great girth.

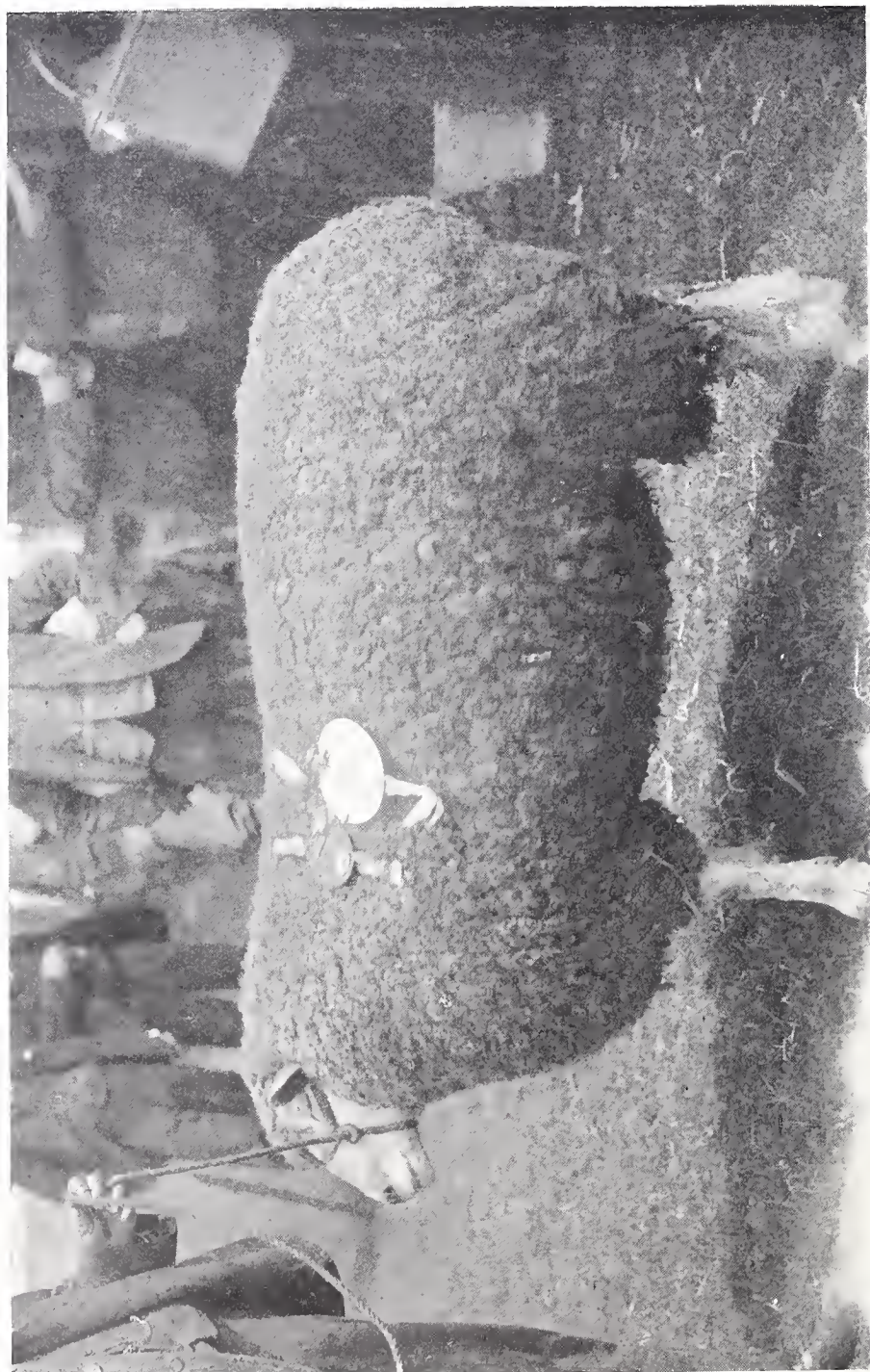


Fig. 9. A Notable Lincoln Ram.

with well sprung ribs, wide loins, level hips, straight and long quarters with great depth of carcass with fine bone. The general form of the carcass is square or rectangular, with legs well set on. Leicesters fatten most readily at from 12 to 15 months old, when they weigh from 160 to 200 pounds. The principal fault of the Leicester is its laying on masses of inward fat, which is a characteristic not esteemed by present day butchers. The great use of the Leicester is in cross breeding for benefiting other races, or producing cross bred lambs. It crosses especially well upon the Merino, and has been the means of building up quite a number of other breeds, seeing that Cheviot, Cotswold, Lincoln and Oxford Downs all possess more or less of the Leicester blood, so that Bakewell builded better than he knew when he created the Leicester sheep. There are a few Leicesters in the United States. There are some good ones in the West, Robert Taylor, of Nebraska, being their chief exponent, and there are a good many in Canada, where conditions seem to suit them right well. The writer would hardly venture to recommend to Pennsylvania farmers the breeding of Leicester sheep, except as before noted, they might use the rams for crossing upon the Merinos. Leicesters would undoubtedly thrive in Pennsylvania, if given good care and kept free from internal parasites, which, frankly be it stated, are the curses of all long-wooled breeds in warm latitudes.

THE LINCOLN AND COTSWOLD.

Quite similar from the view point of one not very familiar with either race are these two breeds. Formed somewhat after the pattern of the Leicester, they are a breed of very large, white-faced and long-wooled sheep. The Cotswold has rather a longer fleece than the Lincoln and the Lincoln perhaps a denser coat. Either breed presents a magnificent appearance when under good management, with their massive fronts, their long, white, curling wool, and when examined closely, their delicious, pink skin. Lincolns and Cotswolds are probably the largest representatives of the sheep kingdom, and bred pure, attain rather too heavy weights for our present market conditions, their principal use in America being for cross breeding. (See Fig. 9.) On the western ranches an infusion of either Lincoln or Cotswold blood in the Merino flocks has proved of great advantage, opinions differing as to which makes the better cross. These cross bred ewes are often retained in the flocks, making magnificent mothers, shearing enormous fleeces, and nourishing their lambs well. The quality of the cross bred fleece is especially good, outselling by far either the pure long wool or pure Merino. There is probably a good field for eastern breeders who can supply western long-wooled rams for this western trade, and here it must be confessed lies the most hopeful expectation of profit from breeding long wools in Pennsylvania. These long-wooled breeds are not quite so prolific as the Downs or Dorsets. They do not drop their lambs early, as a rule, nor are their lambs so easily grown, and unless care is exercised to keep them free from parasites, ruin dire and dreadful follows fast in the wake of the flock. The writer has no antipathy against the long wools, in fact feels always a kindly admiration for the well kept flock of Cotswolds or of the Lincolns, and feels certain that some day breeders with sufficient skill will take up the work

in America and perhaps duplicate the wonderful results that have been achieved in England, where, within recent years, Lincoln rams have been sold to Argentina for as much as \$5,000.00 each. But the breeding of long wools is not to be lightly undertaken by men without experience and unwilling to give careful attention to details.

SOME OTHER BREEDS.

The Romney Marsh or Kentish sheep are similar to the Lincolns, having, however, a short fleece and being of somewhat smaller size. These sheep fatten readily upon grass alone, and are very profitable for grazing upon the fat pastures of the sea coast in southern Kent. It must not be thought, however, that these marshes are swamp lands. They are simply reclaimed pastures that were at one time below the level of the tide. There is no sheep that will thrive on wet or swampy lands. These Romney Marsh have not been introduced into our land so far as the writer knows, though many have been exported to New Zealand and Argentina with good results. They would doubtless thrive in Pennsylvania if given proper encouragement. Far to the north in the highlands of Scotland the black-faced mountain breed prevails. These sheep are semi-wild, inhabiting always the same pastures on the higher heath-clad slopes, and passing with the farm from one tenant to another. They are very picturesque in appearance, with long, shaggy fleeces, black faces speckled with white, and with great horns. Doubtless they would thrive in the mountain regions of Pennsylvania, although without shepherds and dogs trained to care for them, they would prove somewhat troublesome, owing to their instincts, which lead them to be as free and independent as the deer. The writer has often admired them upon their native heath, and been amused by their singular tenacity of purpose causing them to return straightway to their mountain pastures the minute they are released from bondage at their shearing time and marveled too at their stubbornness which makes it necessary to tie their feet when they are to be shorn. Black-faced mountain sheep have been introduced into America from time to time, but so far as the writer knows, have never proved popular here, owing, doubtless, to lack of care and conditions similar to what they have experienced at home.

PERSIAN AND TUNIS SHEEP.

Many years ago a small flock of African sheep was imported from Tunis, some of which were bred in Pennsylvania and afterwards sent to South Carolina, where they became quite popular before the war. The war scattered the flock, and within recent years their remnants have been gathered up and now several breeders are enthusiastically advocating the Tunis breed. Their special forte seems to be to produce "hot house" lambs, and doubtless they have considerable value for that purpose. It would seem to the writer, however, from inspection of pens of Tunis sheep exhibited at fairs, that there has been a considerable admixture of other bloods with the original Tunis, and there would seem to be need of considerable selection and steadfast breeding to type before the breed merits the name of a breed at all. He would not suggest the abandonment

of the endeavor, but merely give greater care and devotion to an ideal, and suggests that the nearly related Persian sheep might be used upon Tunis flocks, infusing fresh blood and re-creating the breed more nearly after its original characteristics.

PERSIAN SHEEP.

Some years ago the Department of Agriculture imported some Persian fat-tailed sheep which were distributed throughout the West, where the writer has seen them in Nevada and California. These Persians are of motley colors, black mingled with white, and of somewhat awkward appearance, according to our ideals, but they have undoubted value because of their fecundity, their large milking properties, and their ability to produce fat lambs. They seem to be, however, unfortunately liable to affections of the feet in damp localities, owing doubtless to the fact of their having been transplanted from so dry a region as Persia.

CROSS BREEDING.

The writer thinks it wise to suggest here that the novice in reading the history of breeds and perceiving how they have been made up by the mingling of bloods of diverse races, should not conceive the idea of producing a new race of sheep on his own account, by cross breeding. It is true that a judicious mingling of the bloods of the Merino and English breeds may make a very profitable farm flock, but usually the first cross proves best, and the half-blood ewes will be of more uniform character and greater profit than the three-quarter bloods, should another cross be attempted. It is particularly inadvisable to be frequently changing from a ram of one breed to a ram of another. The prospective shepherd should decide what type of sheep he prefers to breed, and after purchasing a ram of that kind, should steadily thereafter continue using a ram of the same breeding. The only exception to this rule should be, that supposing he is cross breeding upon a Merino foundation, he may desire to keep part of his Merinos pure, when of course he would select his ewes of highest type and breed them to a pure bred Merino ram, using the ram of mutton breeding upon the rest of the flock. To fix a type and make a new race or breed of sheep, as the English have done in the case of the Shropshires, Oxfords or Hampshires, is the work of long and patient endeavor, and furthermore it can hardly be done by one worker alone. He needs the co-operation of others as intelligent as himself. And after all, it is hardly conceivable that there should be brought into the world a breed that would fill a useful place not already filled by the existing races.

STOCKING.

In presenting in the foregoing pages, an account of the various breeds, it is not meant to be suggested that the beginner in sheep husbandry should stock his farm with pure bred sheep. This may be wise and proper, and it may not. The pure bred sheep are no where in large supply in our land, necessarily their cost is high and the importation of a flock for business purposes is out of the question. It will therefore be necessary to begin with whatever class

of ewes may be found most available, choosing rams of some pure breed and adding also a few pure bred ewes of the same breed. Thus there will be formed the nucleus of a new flock of pure bred sheep which with good management rapidly increases until in time the grades may be discarded, but in the meantime the grade flock will necessarily serve as the business end of the sheep farm. There are several sources from which serviceable ewes may be drawn. The hills of Pennsylvania contain already a good many ewes largely of Merino foundation, and these will form an excellent basis for a grade flock when crossed with desirable types of rams. A little to the south in West Virginia there are many ewes to be had, and a peculiar type of hill sheep. These ewes may be somewhat leggy and bare of wool, but they mostly prove very serviceable mothers for early lambs, and when mated with a good sire, the results will prove quite satisfactory. In Ohio there are great numbers of sheep of the Merino type (Ohio standing fifth in numbers of sheep, having over two millions, while Pennsylvania has about eight thousand five hundred, according to the National Association of Wool Manufacturers), and these Ohio sheep will form an admirable basis for a grade flock. Next, the western ranges may be called upon to contribute from their surplus. It is astonishing how good many of the sheep of the ranges are to-day, having greater size than eastern Merinos, shearing heavy fleeces, and having good vigorous constitutions, and no parasites when they leave the range. These range ewes may often be bought very reasonably in Chicago in the fall. It requires some care to get the right class in Chicago, and a little honesty on the part of the commission man who executes the order. However, by careful selection after receiving the ewes they may be assorted so that any that are wrong in any way may be fattened and the suitable ones retained to breed. It is wise in buying these western ewes on the market to choose the type free from wrinkles or excessively greasy pelts, and sometimes they may be had with an infusion of Cotswold or Shropshire blood, which makes them all the more valuable for the farm purpose. The inexperienced shepherd should avoid lambs or yearlings, and no one should from choice, buy ewes past four years. The young ewes that have never lambed are certain to give more or less trouble at their first lambing, and while the man of experience will get along with them all right, and by buying them have a year longer use of them, yet the young shepherd will do well to begin with experienced ewes.

HOW MANY TO BUY.

The writer believes that the day will come when farms in Pennsylvania will be devoted to sheep, when as many as 400 or 500 ewes will be kept upon one rich farm as is done in England to-day, but he does not think that the time has come as yet, nor advise the young shepherd to begin with a flock of more than 40 to 100 ewes. Fewer than 40 gives not enough to deserve a man's time and attention, and more than 100 will overtax at first the resources of shepherd and farm alike. The reason for this we will see later when we consider summer care and the question of parasites. With 40 ewes the service of one ram will be all that is necessary. With 100, two or three may be used.

PUTTING THE FLOCK UPON THE FARM.

It is essential to begin right in this matter, and it must be remembered that any sheep that have been shipped on railway trains or yarded in railway corrals, or shipping pens is surely infected with germs of scab. (This does not apply to sheep sent boxed by express.) Scab when taken in hand at once is not to be dreaded, but when allowed to run its course for even a few months it becomes a terrible scourge, and may bring ruin to sheep and shepherd alike. Therefore as soon as the flock is home, and before it is put in the barns or pastures it should be carefully and thoroughly dipped. There is another reason beside the fear of scab infection why sheep should be dipped, and that is the sheep tick. Ticks do not exist upon western sheep because of the necessity there for frequent dipping to prevent scab, but on nearly all eastern farms the sheep tick is a great curse, and even though there may be no danger from scab, the flock should be dipped to eradicate the ticks. Most eastern shepherds seem to feel that the sheep tick is a necessity, something like the poor that is always with them, and must always be. This is not true. The sheep tick lives only upon the body of the sheep and, once rid of the pest they will stay free of them until other ticks are brought with strange sheep and introduced again into the flock. The writer, years ago, completely eradicated the tick from his farm, and did not see even one specimen upon his flock for a number of years until finally he brought a fresh supply in buying rams, which he carelessly neglected to dip, and thus found ticks again spreading through the flock. Ticks are usually overlooked because they do not actually destroy the sheep, but merely annoy them by their continual biting, although sometimes they become so numerous as to kill small lambs, but there is no question that they sufficiently drain the life blood of the sheep to cause the loss of many dollars in every flock where they exist. To entirely eradicate ticks from a flock requires two or three dippings, because of the very large eggs or pupæ that are not always destroyed by the dipping, but if two or three dippings can be given at the right time of the year when the wool is short and the expense is trifling there need never again be ticks upon that flock.

DIPPING.

A dip vat is as essential upon a sheep farm as a shed for shelter. It need not be an elaborate arrangement nor costly. There is only required a narrow dip tank which may be built of galvanized iron, of wood, or preferably of concrete, dip enough so that the sheep may go clear in, head and all, and long enough so that it may walk out on an incline without being lifted out, and narrow enough so that it cannot turn around without going through. A width of 6 inches is ample for the bottom and 16 inches will suffice for the top, a length in the bottom of 4 feet with an incline extending up a gradual slope for 8 feet and a total depth of 4 feet will answer very well, although a little greater depth will prevent some splashing. This dipping tank should be set in the ground so that it will be nearly flush with the surface, and at the exit there must be constructed a small drain pen with a tight floor, whence the drippings will drain

back into the tank, thus ten or a dozen sheep may stand and drain, the drier ones being first allowed to depart. There must be two pens at the other end of the tank, one large enough to pen quite a number of the sheep, and the other containing not more than ten or twelve, this small pen right at the entrance. There are several devices for getting the sheep easily into the tank, one of the best being a strip of smooth sheet iron upon which the sheep stand and slide downward into the dip. A little soft soap may be put on this to facilitate the descent where large numbers are to be dipped. They approach the dipping tank at a right angle in single file between high, tight board fences, so that they cannot see the tank or what awaits them, and across the tank on a little ledge a sheep stands while just below its feet is another ledge covered with sheet iron and sloping into the dip. With this arrangement the sheep hurry along through the narrow lane, and seeing one of their number standing beyond, spring across to the ledge just below him and are immediately slid into the liquid below. Such an elaborate arrangement is not necessary for dipping where but a hundred or two are to be put through, but serves well where two or three thousand are dipped in one day. The essentials of successful dipping for scab or ticks are, first, that the dip shall be strong enough. We use the carbolic dips, or those made from coal tar, and sold under the name of "Zenoleum," "Chloro Naphtholeum," "Milk Oil" and similar cognomens. These preparations of coal tar have much to recommend them. Mixed with water they form a milky appearing fluid that is healing to cuts or wounds, is a perfect germicide and instantly destroys lice, ticks or scab germs. It is good for sore eyes or sore mouths, and even to swallow a trifle of it will help expel internal parasites, should any be present. The makers of these dips usually recommend that a 1 per cent. solution be used; that is that 100 parts of water be added to one part of dip, but the writer has practiced using about double that strength, finding the cost of the dip itself to be but trifling and much surer results following the use of the stronger solution. A standard and useful dip is the "Cooper,"—which is said to promote growth of wool—as it is arsenical care must be used not to permit sheep to drink it. Next, the dip must be used hot. And to ascertain whether it be sufficiently hot or no, the writer uses his own bare arm to test the degree of heat, finding thermometers unreliable. Then the water used should be softened by using concentrated lye in sufficient amount to thoroughly "break" it. Next, the sheep when they go in should be put clear in all over, head, ears and all. It is not necessary unless actual scabs are present to allow them to remain in the dip for any length of time, although the manufacturers advise that they be left in for two minutes. But in a farm practice of many years the writer has had never one failure from making the dip as strong as directed, throwing the sheep in once and clear under, and permitting them to come directly out. It must be remembered that in any case they will remain wet for a number of hours, and perhaps for a day or two, so that unless real scabs are present the two minutes' soaking is superfluous. It is well to choose good weather for this dipping, although as a matter of fact, one should dip whenever he takes his sheep home, whatever the season may be and the writer has dipped as many as 500

with the thermometer near zero, putting them at once in a fairly comfortable barn, with the loss of a single animal, and with but slight diminution of thrift. It is fatal to neglect the dipping. Once when the writer trusted to government dipping in the stock yards of Chicago, and failed to give the home dipping to a flock of lambs that he purchased, scab broke out in the middle of the winter, and all the sheep on the farm, nearly a thousand in number, were affected before he was aware of the trouble, which necessitated the dipping of all the sheep, and two or three dippings of some especially badly affected that could not be put after dipping into fresh quarters. It will cost for material about 2 cents a head to dip the sheep, and in labor about as much more. The tank, if built of concrete and set in the ground and covered with litter in very cold weather to prevent freezing, will last forever. So let the prospective shepherd begin his preparations for the home coming flock by getting the dip tank ready.

THE SCAB INSECT.

Of all external parasites the scab mite is by far the most dangerous and troublesome, once permitted to effect lodgment upon the sheep. It is not a common ailment upon farms in the Eastern states, but is sufficiently prevalent upon the ranges of the West to make the danger of infection from that source great, as has already been stated. In fact upon the ranges, scab and starvation are the two principal diseases among the flocks, and it is the province of the eastern farmer to cure both of these troubles. The scab mite is an insect so small that it is not quite visible to the naked eye, lives upon the skin, and by irritating the surface, it causes a flow of the fluid upon which it lives, and finally by continuing this irritation, scabs or crusts are formed beneath which the insect deposits its eggs. In a course of two or three days these eggs hatch. The newly born parasite becomes adult in fifteen days. Each female parasite will lay about fifteen eggs, ten of which will bring forth females and the other five males. The new parasites, as soon as they are hatched, migrate and infect the adjacent territory, which makes the scab patch spread, by the constant advance of its circumference, and the eggs of new parasites are deposited upon posts or boards upon which the sheep rub themselves, and thus are ready to seize any advantage to again locate themselves upon another sheep, when they in turn become centers of affection. Gerlach, a German authority, computes that in three months a single female scab insect may become responsible for the existence of 1,500,000 progeny. Thus in forty-five days after infection the increase from one parasite might be 1,500; in seventy-five days, 150,000, and in ninety days, 1,500,000. As a matter of fact it requires about ninety days for the scab disease to become well spread and very troublesome after introduction into a clean flock. The symptoms of scab are first, the great uneasiness and itching of the sheep as evidenced by their rubbing themselves against posts or fences, biting their wool or reaching to scratch the parts with their feet, and sometimes they will be seen to roll upon the ground. If the wool be parted there will be seen first a whitened and thickened condition of the skin at the infected spot. Later on the wool will be pulled from the place, if the sheep

can reach it, and the genuine scab will be in evidence. The disease, if unchecked, does not run its course and cure itself, but continues to work torment upon its unfortunate host until it is nearly denuded of wool and a mass of mangy sores, a dreadful object to contemplate. The writer has thought best to enter thus fully into a description of sheep scab because one ignorant of its evils may very easily underrate its danger, and thus fall into great trouble, whereas a stitch in time will save all trouble. The writer has never in one instance failed to prevent the development of the disease by one thorough dipping given as soon as the sheep reach the farm, as previously described. Should there be an actual existence of well developed scabs, however, he would prefer more thorough treatment, including the breaking up of the crusts and two dippings at intervals of ten days. The writer likes to turn the freshly dipped sheep at once into the quarters in which they are to remain, so that they will then by rubbing against hay racks and posts, thoroughly wet the entire wood work with their dip soaked fleeces.

ASSORTING THE FLOCK.

When first the flock comes home the young shepherd may be dismayed by their gauntness and appearance of hunger, and inclined through the kindness of his heart to at once relieve them of this distress by generous feeding. This he will not dare do. No grain at all should be given the hungry sheep, nor should they be turned at once into a field of rich clover, but preferably upon a rather dry pasture or else given what good hay they will consume, and not until they have completely recovered from their semi-starvation should they be given any grain. After they have dried from their dipping, comes the assorting, and this interesting task should be superintended by the owner himself, and by the way, in our land it is hardly possible to hire any shepherd who can relieve the owner of personal responsibility in many details of management. In England such professional shepherds are to be found, and right interesting it is to note how they not only assume responsibility, but take upon themselves to direct the management according to their own ideas, even laughing sometimes at their masters wishes when they do not coincide with him in judgment as to the correct way to do. But in America we will hardly develop soon such a class, as they are the result of long established traditions and customs. In assorting the flock each sheep should be caught separately, examined as to the condition of her teeth to see whether she has a good mouth, or through age be losing part of her teeth, and thus approaching the limit of profitableness. If through defective teeth or any other cause it is thought not best to retain her in the flock, some mark should be put upon her so that she may be readily known, and may be separated and put with others like her in the fattening pen, or perhaps permitted to bear one lamb, and then be fattened off together with her lamb, as even old and broken mouthed ewes will do this very nicely, provided they are fed suitable food and given a little more comfort than younger ewes demand. Next, the feet should be looked after and carefully trimmed, cutting away only the superficial horn and not drawing blood. Should there be any foot lameness when the flock comes home the lame sheep should at once be treated thoroughly for foot rot, no matter whether the

seller has assured you that he "never had foot rot upon his farm" or not. The treatment for foot rot will be indicated later. It is very simple and inexpensive and like the treatment for scab, a stitch in time saves nine hundred and ninety-nine. Next, the udder should be carefully examined. Some ewes will be found with defective or spoiled udders, caused by garget. Some may be found to have teats cut off by careless shearers, and all of these should be permanently thrown out from the flock. The shepherd is born to troubles enough in the natural course of events without adding to them the trouble of seeing lambs born into the world without any visible means of support. Then if the ewes have any horns it should be noted whether they may be pressing against the face, and thus causing pain, and if so, the points should be cut away with a saw. These simple duties over, the flock may be declared assorted and ready to go to their new quarters. A good mark to put upon the defective ones is to clip off half of one ear. This disfigurement is one that cannot be lost, and speaks plainly to the owner of the necessity of prompt fattening and disposal of such marked animals.

GETTING READY FOR WINTER.

We are assuming that the flock has been purchased during early fall or late summer months, which is the best time to stock a farm with ewes. They have now been dipped and assorted and are ready to go into pasture. It is good management at this time to put the flock upon fresh and succulent grass, if it is available, and if not, some other feeding should be given in addition. It is assumed that the sheep at the time of purchase are in comparatively thin flesh, and provided they are not emaciated, it is better that they should be in comparatively thin flesh. Fat ewes are costly to buy by weight, and presumably are fat because of having been barren the preceding season. It is necessary now to see that these ewes gain in flesh, so that they go into winter in strong, vigorous condition. Fortunately the season is in our favor. The fall is the natural time for all grazing animals to lay on fat. The deer fatten up in the fall and so do cattle, and doubtless the wild sheep. It is Nature's provision of storing up a surplus of flesh that may be drawn upon during the stress of severe weather, or dearth of food in winter time. A sheep well fed and in strong condition at the beginning of winter, si half wintered already; whereas if she go into winter in an emaciated condition it will require very careful feeding to bring her out with a strong lamb by her side in the spring.

PUMPKINS.

There are a number of crops that may be sown to be fed in connection with grass at this season. Common cow pumpkins are invaluable aids to the shepherd at this time of year. Sheep eat them greedily and gain rapidly when feeding upon them. They are readily grown in the corn fields, or in some specially devoted plot of ground, and yield on good soils, an enormous tonnage. There is never any danger in feeding pumpkins, as they do not cause bloat nor indigestion, and best of all the pumpkin seeds are an excellent vermifuge and when fed in large amounts, serve to expel tape worms, and doubtless some other forms of internal parasites.

The writer has never had evidence of tape worms in his flock, which happy experience he attributes to the very liberal pumpkin feeding that has been his habit for many years. The seeds are the richest and most valuable part of the pumpkin, and consumed alone would doubtless prove too rich for the sheep's digestion, but when consumed together with the pumpkin itself, they do no harm. It is the custom of the writer therefore not to break open nor cut into the pumpkins when thrown to the sheep upon pasture, but to permit them to gnaw into their shells at their own will, and this process is sufficiently difficult so that when they get one broken open they will consume it utterly before attacking another. It hardly pays to attempt to keep pumpkins over winter, but the best practice is to strew them broadcast by the wagon load over the pastures, letting the sheep gnaw into them at will. Cows relish them as well as the ewes, and they make a notable increase in milk when thus fed.

RAPE.

Beside the pumpkin plant there is rape that may be had in the fall at little cost. Rape is a plant allied to the cabbage, having a similar leaf, and being of about the same composition, although not forming close heads. It grows with less care and attention than the cabbage and makes an enormous amount of feed to the acre on fertile soil. Rape may be sown in drills, or broadcast at the rate of two to four pounds to the acre, at almost anytime after March, although for fall feeding it should be sown in June or July, and often it will thrive when sown in the corn at the time of the last cultivation. The expense of thus sowing is so small that even should the season prove too dry for the rape, there is nothing lost but a little seed and a small amount of labor, whereas if the season prove moist in late summer and fall, there will be secured grazing worth as much as \$2.00 per acre. In feeding off rape, the sheep may be permitted to go directly into the field, where they will waste comparatively little, and they should always have at the same time a run upon good grass or regular feeding of good hay, with possibly a little grain, if a great amount of gain is required. There is a slight danger of bloating from rape feeding, although in a number of years of experience the writer has never lost a sheep from this cause. Ewes should not go on the rape when extremely hungry, and if this care is given, little trouble will be had from bloating. Rape endures cold well, and it requires a temperature of 12 degrees, Fahrenheit, to injure the leaves, although if sheep be permitted to walk through the field when frost is upon the plants, the leaves will be bent and will blacken and die wherever touched when frozen, so that as the season progresses, care must be used to permit the flock access to the rape field only after the frost is gone in the morning.

TURNIPS.

In England and Scotland, turnips are the great reliance of the shepherd for fall and winter feeding. Swedes are usually grown, and in their climate yield very largely. In Pennsylvania the Cow Horn turnips seem very productive, and doubtless will be relished by the sheep.

CARROTS.

Carrots are among the best roots that can be grown in our climate, as sheep relish them better than any other. The large varieties should be grown, not the table carrots, and they can of course be stored and fed all winter.

MANGEL BEETS.

Mangel beets sown early in the spring are very productive, and are relished by the ewes. They should not be fed in large amounts to rams.

RYE AND OATS PASTURE.

An excellent combination for fall grazing is that of rye and oats sown together. Sheep relish the oats especially well, and eat the rye next. The hard freezes destroy the roots of the oats when the rye will survive the winter to give additional grazing. Rye pasture is a bit deceiving as to its fattening properties. It affords much valuable succulence, gives the flock healthful exercise and occupation, but it must not be depended upon alone for building or maintaining flesh. However, rye grows so readily on comparatively poor soil, and is so hardy and resistant to cold, and it is in use so early in the spring and late in the fall, that it is safe to recommend it to Pennsylvania shepherds.

HANDLING THE EWES.

The inexperienced shepherd may readily be deceived by the roundness and apparent plumpness of his charges as winter draws on. Their fleeces, if in health, hide all angles, and they may be thought in fine condition and even fat when really they have not nearly enough flesh to properly start in the winter. It is well therefore to handle them occasionally, learning by putting the hand upon the back to ascertain what amount of flesh they are really carrying. A little exercise of this kind will make the shepherd quite expert in judging of their condition. There is still another reason why they should be gaining in flesh at this time of the year, it is the breeding season, and if they are in thriving condition and actually laying on flesh at this time, there will be a much larger per cent. of twins among the increase, than should they be in a stationary or retrograde condition, and therefore a much better increase at the lambing season.

MATING.

The ram is half the flock. It is well, therefore, even if we have had to economize somewhat on buying ewes, to select a ram of high quality. He should be pure bred, of whatever breed the shepherd prefers, but suited in his character to mating with the class of ewes purchased. For instance, if the new flock is a long-legged one from the mountains the ram should be of a compact, short-legged breed, such as the Southdown, Shropshire or Dorset. It makes a difference, too, whether the progeny is all to go to market or whether some are to remain upon the farm as the nucleus of a new flock of cross bred ewes. Whatever sort is chosen the shepherd will do well to

keep that kind in after years so that his flock will grow steadily towards his ideal. In selecting a ram it is not usually well to choose one of extreme size for the breed, for such overgrown rams do not usually beget the strongest lambs, but rather to choose one of medium size and having high quality and great vigor of constitution. The evidences of this are seen in a short, thick neck, a broad breast, a short, strong back, short legs and a general alertness of manner, with a bright eye and quick movement. The ram should have a bold manner; he should be a ram all over.

The age of the ram need not be an inflexible matter, some rams are serviceable at eight or ten months and remain serviceable for six years or more, though in general they are at their best when one to three years old.

In choosing a ram, the shepherd should carefully part the fleece to examine the skin. In all sheep a bright, clean skin with the vigorous blood showing through it is an indication of health and vigor. A chalky skin is almost a sure sign of internal parasites and a sheep so afflicted will prove of little value until rid of them. This rule applies as well to ewes and lambs as to rams. There are some Downs that do not have pink skins, owing to a bluish cast caused by pigmentation, but Dorsets, Cotswolds, Merinos and all light faced sheep should have skins as pink as cherries.

The time to put the ram with the ewes varies according to the use that the ewes are to have. If they are to drop winter lambs to be fed off at their mothers' sides the rams should be put with the ewes in August. There should never be any lambs born later than April, unless upon very cold mountain pastures, so that the rams must be separated from the ewes the first of November.

The period of gestation in the sheep is about five months, or to be exact, 142 to 150 days. The shepherd should, therefore, calculate when he needs the lambs to come and turn in the rams accordingly. He must, however, take into account the kind of ewes he is using seeing that some will breed at a much earlier time than others. It would be folly, as an illustration, to try to grow hot-house lambs from Cotswold ewes which naturally drop their lambs in spring. As has been stated, the Merinos and Dorsets are the earliest lambers, Shropshires perhaps coming next, though there is little difference in this respect between them and the Southdowns.

When very early lambs are desired, there are several things that may be done to hasten their coming into heat. That experienced shepherd, H. H. Miller, of New Jersey, writing of Dorsets, says:

HOW TO GET FALL LAMBS.

"First, have the ram with the ewes not earlier than the middle of March, not later than middle of May.

"Second, put ram with ewes nights, not days.

"Third, use a young ram and feed him well when in service. .

"Fourth, do not have the ram too fat.

"Fifth, do not have the ewes too thin.

"Sixth, if ewes were not shorn in the fall shear as early as you dare.

"Seventh, feed the ewes green food, such as silage, turnips, carrots, mangels, with some corn."

The idea is to imitate as nearly as possible the natural conditions of September and October, when ewes naturally come in heat and conceive. Then the nights are cool, the grass generally green and the ewes improving in condition, all of which tend to make them come in heat. There is no doubt that the attention of a young and persistent ram has a great deal to do with bringing them in heat, seeing that animal passion is largely a matter of suggestion, and bodily manifestations are preceded by mental conditions.

There is yet another thing that is practiced by some growers of very early "hot house" lambs, that is compelling the ewes to submit to service whether in heat or not. The first service does not usually cause conception, but it seems to direct a current of blood to the organs of generation so that the ewe comes naturally in heat some days later and when again served conceives in a natural way. However, the young shepherd will no doubt be content with ordinary methods at first and may proceed to turn his ram with the ewes in September, which will bring the lambs in February. There are tables of pregnancy that show just what day to expect a lamb, calf or colt from any mating, and each breeder should possess himself of such a table so that he may make exact memoranda of when the young things may be expected. If the ram is to be turned directly with the flock it is better if he be only turned in at night, being taken up during the day and given the cool and quiet of the barn, with generous feeding of oats or bran. Only a very vigorous ram should be turned out at all times with the flock and even from him better lambs will be secured if he is cared for as described.

Even a better method is to keep the ram up at all times, bringing the ewes to him and penning them in a rather small pen early in the morning. He may then be turned with them, first painting his brisket with red paint, and as fast as he finds a ewe in heat and serves her she should be taken out, when he will search for another. In this manner one ram will readily attend to 50 to 100 ewes during the season and exhaust himself less than if turned out with one-fourth the number.

When this method is adopted, the ewes as they are taken out may be marked in such a way that the shepherd will know by their colors just what week to look for their lambs. For instance, if he has a table of gestation, he will mark one week with a spot of red upon the poll and make memoranda that the red spotted ewes should lamb the week beginning the 5th of February, or whatever date. The next week he may use green, then yellow and so on. In this way he finds himself easily possessed of data that will prove of great value to him in the management of his flock as lambing time approaches.

When the flock is large and two rams are used it is well to divide it or else to turn one ram out one day, the other the next day. It is a waste of energy to turn them out together and may lead to disastrous fighting. When a ram has been tried and found to be a getter of fine, vigorous lambs, he should be retained as long as he possesses his powers, even at the risk of some little inbreeding. Good, prepotent rams are not abundant and one may rashly discard something that he cannot easily replace. It requires a vigorous ram to serve properly 40 ewes turned with him in pasture.

WINTER CARE AND MANAGEMENT.

It will be observed that this bulletin deals only with ewes, rams and young lambs, the writer not believing that upon Pennsylvania farms the aged wethers have any legitimate place. The day of "four-year-old wethers" has gone by anywhere excepting upon the far western ranges, where they may still be kept sometimes at a profit, owing to the low cost of maintenance, but even there the wether bands are becoming fewer and fewer and bands of ewes are acknowledged to be the more profitable. When the ewe flock is assorted for winter, there will be two or three classifications: First the normal ewes pregnant and strong enough to need no especial care. Next, the older and more feeble ewes needing better attention, and perhaps a little ground corn, and then the ewe lambs that have not been bred at all. These young ewes must be fed liberally and kept growing well, although they should not be fattened. The main difference in the management of them and the older ewes being that they are afforded a little more grain or roots in order that their still developing framework may receive no check. They should have an abundance of clover or alfalfa hay, the opportunity to shelter in a storm-proof shed and the run of the fields whenever the weather is not too stormy. A great pleasure, this flock of maiden ewes is to care for. They respond so readily to kindness and in the hands of a loving shepherd, become veritable pets, and this too, is profitable, for by early securing an intimate acquaintance with each, when later she becomes a mother and perhaps in need of friendly assistance, she will not be wild nor difficult of approach. The development of these young ewes should be principally by feeding of clovers, early cut and nicely cured, with only a small allowance of grain, that preferably being of oats or wheat bran. Little corn should be put into the ration, seeing that corn goes mostly to produce fat and has in it little of the elements of growth. The aged ewes need principally the same treatment, saving that if they have broken mouths, their grain may be ground for them, and there is nothing better to bring them nicely forward than wheat bran in moderate allowance. There is danger in feeding too much wheat bran to pregnant ewes, and of this danger we will speak later. The main flock will, if they have gone into winter in strong condition, need little, if any, grain, provided they have a sufficient amount of good clover or alfalfa hay. This is a matter, however, that must be left to the discretion of the shepherd, and herein is an opportunity for him to give proof of his inherent fitness for his position. He should know at a glance the condition of every sheep in his flock, whether it be strong enough and sufficiently well nourished to bring forth a vigorous lamb and to have sufficient milk for it. He will learn to know this, if he is an observant man, in a short time, and in the meantime he should resort to the more clumsy expedient of quietly catching hold of a ewe from time to time and examining her to see how much flesh she has upon her bones. It is better to feed a little grain regularly than to permit the flock to become poor, and then try all at once to restore them to a proper condition. In fact regular maintenance, not sudden bringing up of condition, is the true secret of success. The ewe flock should

be out of doors every day and encouraged to take considerable exercise. It is well to feed long fodder, such as corn stalks upon the pastures and even at a considerable distance from the barn. It will encourage them to prolong their rambles, this regular out of door exercise being a prime requisite in keeping the ewes in vigorous health and enabling them to bring forth very strong lambs. The writer has observed with astonishment that upon the western ranches the birth of a weakly lamb, one needing assistance to stand upon its feet and reach his maternal fount, is of the rarest occurrence, and upon the ranch of which he was manager at one time he observed a lambing of 2,500 ewes, without, so far as he could see, one weakly lamb in the lot, although there were a few deformed ones. This favorable result must doubtless be due to the natural conditions under which ewes are found upon the ranges, having sufficient food and not too much, abundant exercise and fresh out-door air. It has been said with considerable truth that the worst enemy of a sheep in the barn, is another sheep, which is only another way of saying that the air in the barn should be practically as pure and good as out of doors. The writer has seen very costly and disastrous failures from keeping sheep closely housed in barns in winter, and between the risk of losing them from too much exposure and from too close housing, he would prefer the exposure every time.

Having directed the shepherd to frequently catch his charges, it may be well to say a word as to how a sheep should be caught. The ignorant hand seizes it by the wool upon the back and holds it struggling violently until he has overpowered it, or perhaps throws himself clumsily upon the sheep with all his weight, inspiring it with terror, and even causing serious consequences, especially in pregnant ewes. No skilled shepherd ever seizes a sheep by the wool, any more than he would lead a little child by the hair. A convenient thing to have about the sheep barn is an old-fashioned shepherd's crook, made of wood, of such shape that it may be slipped around the ewe's neck, when it will be found comparatively easy to hold her without struggling. This crook may have a handle six or eight feet long, made light as a fork handle. The crook may be made of steel and an old horse rake tooth will serve a good purpose, as when bent into shape it may be tempered and will prove elastic and good. For catching sheep in pasture a different form of crook is used. It grasps the hind leg at the ankle, so that the shepherd may slip up behind his charge and secure it before it is aware. This answers the purpose well, but for the barn use, the other is better. These crooks for catching the foot are sold by sheep supply houses, the others are readily made by the blacksmith.

How much flesh should the ewe carry during her pregnancy? She should be what the farmer calls "fat." That is, she should be in strong flesh with quite a little fat on her body, but not fat according to the butcher's term. She is better for being somewhat too fleshy than to be too emaciated, but the happy medium is for her to be strong, well-fleshed, yet quick, active and vigorous, as she will be if given the opportunities we have mentioned. The proper food for the pregnant ewes in winter should be mainly of dry forage, such as clover or alfalfa hay, with what corn stover they like and oat straw to pick over if they care for it, with a small daily allowance of

sweet corn silage, providing it is at hand, and if available, roots of some form or another. Roots are not indispensable before lambing, and the feeding of too many turnips sometimes causes bad results. If clover or alfalfa hay is not available, and the forage must chiefly be of corn stover, timothy, wheat straw and the like, then more protein must be added to the ration, together with more bone material, to supply the nutrients needed by the growing lamb, as well as to nourish its mother during the period of her pregnancy. Oats or wheat bran will supply this protein and either one is rich in bone material.

There is danger, however, of feeding too much bone material to a pregnant ewe, the writer having had an experience once that taught him a costly lesson. Having some very beautiful Shropshire ewes from which he desired to get the best possible results, he allowed them an unlimited amount of wheat bran, together with clover, and timothy hay. The ewes presented a beautiful appearance up until lambing time, and were certainly the pictures of health and vigor. They dropped a large crop of lambs, many of which were of superb quality, but some of which were of such enormous size that they could scarcely be born at all. One ewe especially, the finest of the flock, distinguished herself by delivering a lamb that weighed 17 pounds at birth, whereas the normal weight of a lamb would be perhaps about 6 pounds. The unfortunate ewe died soon after, and the lamb, although at its birth very strong, was killed by the writer's unskillful attempts at feeding with cow's milk. Such lambs, however, as came safely into the world, developed well and every ewe proved full of milk, as might have been expected from such liberal supply of milk-producing food. The next winter, however, the writer remembering his mishap, and being told by some old-time hill shepherds that his methods were all wrong, put his ewes on so scanty fare as to give opportunity to "rustle," and radically changed his programme. And being short of barn room, and feed as well, he turned the ewe flock out into the wooded pasture, giving its room to fattening lambs, and kept the ewes during the winter upon corn stover and oat straw, mainly without any grain. When lambing time came the lambs were delivered easily enough, none of them being excessively large and many quite small ones indeed were very strong and active at birth. But then a curious phenomenon of sheep nature manifested itself, for the ewes being very poorly fleshed and lambing before grass had come, found themselves without milk in their udders, and thus without any maternal solicitude in their hearts. The writer learned then that curious truth that the nerve that goes from the udder of the ewe to the brain, reaches the particular region of the brain where is situated the instinct of mother love, so that unless there is a stimulation from a full udder, there is no development of mother love at all, and as a matter of fact, these ewes promptly disowned their newly born lambs, leaving them to the rueful attendance of their bewildered and dismayed shepherd. There never was a worse lambing, nor a more remorseful attendant than him during this season. However, later on he learned to strike the happy medium, and nourish the ewes well enough so that the lambs were born strong, their mothers full of milk for them, and yet not to overdo the thing so as to cause trouble at lambing time.

One of the most surely fatal systems of treatment for pregnant ewes is to overfeed them with corn. The writer often finds in his feeding barns, ewes that accidentally prove to be with lamb and that are being fed upon corn and alfalfa hay. If those lambs happen to be born soon enough after the mothers have gone upon feed, all may be well, but if the advent is delayed until their mothers are getting fat, and are inclined to be sluggish, lying about a great deal, the lambs are born into the world without strength enough to hold up their heads. They are large, fat, soft and flabby, with hardly any vitality at all, and not one in ten of them can be raised. In England the writer has seen some very remarkable examples of successful lambings. One in particular he remembers of a Dorset flock of 360 ewes that raised about 550 lambs. These ewes were out of doors every day, in that comparatively mild climate, and were fed as has been directed, with sufficient food to nourish them well without developing a degree of fat to make them sluggish. The anxious young shepherd may think it impossible to have his flock out of doors every day during winter, for fear that lambs may be born in the snow and lost, but it has been the experience of the writer that when the ewes were given free access to their snug quarters they would in nearly every instance come home to drop their lambs. And by a little personal care, without which sheep will not succeed in any event, there will be small loss from this cause. Certainly the shepherd should see every sheep of his flock several times every day during the lambing period.

THE LAMBING SEASON.

We have now brought the flocks successfully to the beginning of the lambing season, always the most interesting time to the shepherd, although if he has done his part well, it need not be a season of anxiety. Before the lambs begin to appear, the shepherd should provide himself with a few useful conveniences. It will be remembered that we have planned to have these lambs born in the late fall or winter season. If they are born early enough so that they may come upon the grass, there is little preparation necessary, but when lambing in sheds, some carpentering is necessary to make the thing go off well. There should be provided some little panels like small doors, each one about $3\frac{1}{2}$ feet high and 4 feet long, two of these panels being hinged together at the ends. They may be of light wood and made of boards set close enough together so the lambs cannot crawl through; better still, be made of $\frac{1}{2}$ inch boards put solidly together so that the ewes cannot even look through them. Upon the edges not provided with hinges should be large wire hooks that can be fastened into staples driven into the side of the barn. The purpose of these panels is to provide small pens against the side of the barn in which ewes with their new born lambs may be confined for a day or two until they have become well acquainted with each other. Beginning at the corner of the barn a pair of these panels, opened out at right angles like an "L," make one square pen 4 feet by 4 feet, and then when it becomes necessary to provide another, it is set up at the side of this one and so on until a row is established across one side of the barn. If there be need, another row may follow, and so on indefinitely as may be

required. The shepherd will keep careful watch as the time approaches when lambs may be expected, and noting that the ewe is about to be delivered, he may at once place her in one of these pens where she may remain undisturbed; and supposing she be delivered of twins, neither of them can stray away from her while she is giving her attention to the other. There is serious danger when twins are born in a crowded sheepfold that one of them may wander away before the mother can give it her attention, and naturally the little things cannot at first distinguish their own mothers, and may perish before the shepherd appears to set things right. A very much larger per cent. of lambs will be saved by the use of these small pens than if they are not at hand. The shepherd should learn to distinguish the symptoms of approaching labor in the ewe. If he is observant, he will often notice an uneasiness in her, and sometime that she will even go about looking for her lamb, as though she thought it was already born, instinct apparently telling her that there should be one about somewhere. There are other symptoms that an observant shepherd will notice, and that is the time to place her by herself, or failing that, to keep good watch until she is delivered.

It is not very often that the shepherd will be called upon to assist the ewe in delivering her lamb. He should be watchful, however, and not permit her to carry her labor too far without going to her aid. Oftentimes the lamb will have too large a head for ready delivery, and the shepherd can gently but forcibly push back the parts past the head till it is delivered. After this he may, when next her pains cause her to struggle to expel, take the head and feet and gently pull till the shoulders are delivered. The expulsion of the rest of the body is easy and the shepherd should retire and leave her to accomplish that unaided. The natural position for delivery is head first, with the front feet one on each side of the nose. Sometimes the presentation is wrong and delivery cannot take place without aid being given. In that case the shepherd is fortunate if he has a small, strong hand. He should lubricate his hand and wrist well with lard, which may be disinfected with a little turpentine mixed with it, and carefully introducing the hand feel slowly and thoughtfully about to see what is wrong. There must be no long or rough finger nails on his hand to wound and cause irritation. A front leg bent backward can be straightened out, the head turned back must be brought forward. If a presentation of the hind feet first is had delivery may take place. As soon as the lamb is delivered, if the ewe is weak, the shepherd should in her place clear the mucus from the nostrils of the lamb so that it may breathe and rub it dry, then get it to take some of its mother's milk.

In case of a dead lamb within the ewe, it must be taken away and her womb washed out well with warm water, then disinfected with a 1 per cent. solution of disinfectant like "Zenoleum." If the lamb has been long dead before being removed, it is doubtful if she will recover, owing to absorption of poisonous matter from the decaying tissues.

Should the lambs be born in very severe weather, especially if there be twins, it may be necessary for the shepherd to assist a little in the way of keeping them warm until their mother's milk has given them a store of internal heat. An old barrel sawn in

two is a convenient thing to have at hand. In this may be placed a jug of hot water about which the new born lamb may be curled, with a blanket thrown across the top, and there he will keep as warm as toast until such time as his mother can give him her attention. A slightly chilled lamb may be revived in this manner, although if through neglect one should become almost chilled to death, more energetic measures are necessary. In that case immerse the lamb in hot water, as hot as the shepherd can bear his hand within, immersing it bodily except the nose, the water being reenforced occasionally to maintain the heat, until finally the natural heat is restored. The writer has almost resurrected dead lambs by this method, and as soon as they have regained their strength enough to desire to suck one's finger, they may be given a teaspoonful of cream with a little hot water added, and occasionally, if still weak, a drop of whiskey. It is better not to give much cow's milk to a chilled lamb, but take it as soon as practicable to its mother, helping it to nurse and get a store of her own specially prepared milk, which seems to have in it a wonderful capacity for imparting warmth to the new born offspring. In fact the writer has never known a lamb to chill to death after once being safely delivered and filled naturally with its mother's milk, and he has seen the most astonishing instances of little lambs a day or two old as warm as need be when the thermometer was far down in the tube. When many twins are being born, as will happen during some seasons, the grateful shepherd will find his cares not a little increased, although very happily so, and another useful convenience is a box or half-barrel full of dry wheat bran, in which the newly born lamb may be buried all but his nose, until his mother is delivered of her other lamb; when she may give them both her attention. This bran keeps the animal heat in the little lamb's body, and as much of it as may stick to him will be licked off by the ewe when she has time to give him her attention. Occasionally a ewe will fail in maternal instinct and give her lambs either no attention at all, or such slight attention as to impair their chances of life. It is more apt to happen with young ewes that have never yeanned, or with those that have been improperly nourished, so that they have no milk in their udders. In the case of the young ewe, a little patience on the part of the shepherd is all that is necessary. It may be required to hold her for a few times while the lamb sucks, after which she will generally be good, and her mother love will grow. Always the shepherd should turn the ewe gently upon her rump when first the lamb is born, and if it has not already been done, clip away loose tags of wool that may be upon her udder and which the inexperienced lamb may seize instead of the teat. Then start the milk, which may require a little effort, and holding the lamb to the teat, see to it that it takes in a few mouthfuls of milk. This little attention will save the lives of many lambs, and requires but a minute of time. The writer has found it most practical to kneel down by the side of the ewe, supporting her body with his left arm while she sits upon her rump, then taking the lamb by the head with his right hand, gently lay it down upon its side and draw it forward until, still reclining upon the ground, it reaches her teat. By putting his little finger in the lamb's mouth, he readily gets it hold of the right place, when

instinct does the rest and the milk begins to be transferred from the mother to the lamb. Should the ewe prove very refractory toward her lamb, it may be necessary to confine her head in a small stanchion, which may be simple stakes driven into the earthen floor of the sheep shed and fastened at the top with a cord. Thus confined she cannot injure the lamb, and after it has learned the way, it will draw its nourishment whether she will or no. This, however, is very seldom required when a ewe has her own lamb by her side. Occasionally a lamb will die, or be born dead, and its mother have sufficient milk so that it is desirable that she should take another lamb to raise. If there should be a supply of twins at hand this is easy of accomplishment. The best plan is to carefully remove the skin of the dead lamb as soon as possible after its death, taking the off nearly whole, as one would strip a stocking from his foot, sprinkling salt over the flesh side of the skin, so that it may not become offensive, and at once draw it on over the lamb that is to be adopted, putting the little legs through the holes where the other lamb's legs were, and fitting it on as neatly as a glove. Then by placing this skin-clad lamb in the pen with the bereaved ewe, she will nearly always adopt it at once as her own.

There is reason for this phenomenon, that, well understood, helps a shepherd through a number of perplexities. The reason is, that the ewe knows her lamb only by its scent, and putting her nose down upon the skin of the lamb she has lost, she at once concludes that it is her own, and that she has been mistaken about its death. Should she be at first a little doubtful, to gently hold her a few times while the lamb sucks, will tend to reassure her until she will accept the new charge as her own. The writer has practiced this transferring for many years, and never so far as he can remember, has it failed to effect the desired end, although sometimes when the dead lamb was very large and the new one much smaller, the ewe has been rather skeptical as to her responsibility for the new infant, and recourse to the stanchion has been had for a day or two. The philosophy of the stanchion is similar to that of the lamb's skin. If the lamb can partake of the ewe's milk for a few days, it will then have an odor such as instinct tells her it should have to be her own, and she will accept it. Whereas the ewe knows her lamb by smell, the lamb knows its mother only by her voice, and the writer has seen a very pretty sight oftentimes in the flock when a mother, feeling by her swelling udder that there is in it nourishment for her lamb, has begun to call it, when it would at once recognize her tones and forsaking its comrades go with a rush to attend to the dinner call. Very wonderful is the faculty of a lamb to distinguish from more than a thousand ewes its own mother's tones, and the writer has seen upon his own western ranch oftentimes a bunch of 500 or 600 lambs playing upon a sunny hillside, the ewes on an opposite side of the gulch, when all at once some ewe coming out from among the throng would call to her absent offspring and in a few moments one would disengage himself from his comrades and rush across the hillside, approach his mother, who, although she had seen him many thousands of times before, refused to acknowledge his kinship until she had bestowed the familiar salutation of touching her nose upon his rump. Then re-

assured by the right odor, gave him his dinner and he returned to play among his comrades. The use of cow's milk to help the new born lambs is not much to be encouraged, and is quite apt to bring on troubles resulting in the death of the lambs. The writer thinks that to dilute the cow's milk with about one-half of warm water, adding a little cream, makes it more safe, but if the ewe flock has been properly fed, there will be seldom need of this extraneous assistance. Sometimes, however, where triplets are born, or in case young ewes with many pairs of twins cannot well nourish them all, lambs may be grown by hand upon cow's milk. The chief care should be not to overfeed, to feed often and at regular hours. Very valuable sheep come sometimes from these cosset lambs.

There is no happier time than during a successful lambing period. Each day sees a new lot of strong, promising lambs, and the eager shepherd's interest is divided between the wee newcomers and the ones that, born a few days ago, are already making strong and lusty youngsters of a week or ten days, and swelling like pea pods and playing happily in the sun. There is something about all this that makes a man gentler, more patient and unselfish. The true shepherd never begrudges the hours spent in the care of his wee charges, nor the journeys by lantern light to the barn on winter nights. The work is not hard, but requires constant faithfulness and attention to the smaller details to bring success. The lambing barn should not be extremely warm nor close, although it should be sheltered from any chilling draughts from the north or west side, and if there can be a room adjacent in which may be safely set up a stove with a few small pens for emergency in very severe weather, and a cot on which the shepherd can sleep during some of the nights of the most busy season, it will be found very convenient and profitable. It may be thought by the prospective shepherd that it will be better and safer to defer lambing until warm weather has come, that then he will easily save a greater per cent. of lambs with less trouble. In the experience of the writer this has not been true, seeing that at that season the rush of spring work interferes with the care of the flock and more lambs are lost through inattention and neglect than from cold during a winter lambing season. There is, moreover, so much more of profit in having the lambs born early, and so many dangers are escaped to which the late lambs are heir, that the writer unhesitatingly advises that for Pennsylvania shepherds as many lambs as possible be born before March.

THE MOTHER AND HER BABY.

We now have the lamb brought safely into the world and its mother well supplied with milk with which to nourish it, and the next consideration is the future treatment of both ewe and lamb, and here lies a grave peril arising from the very desire of the shepherd to help the mother by his kindness. We have seen that she has at the beginning a good supply of milk, and indeed there is some fear that she may have too much, and through this fact may come trouble. It is well to milk her out clean at least once a day for several consecutive days, or until the lamb can readily take all of the milk, since this first milk appearing within the udder is intended to be consumed only at the beginning of the lamb's life, and if retained in her udder for a number of days, it will surely

sicken the lamb. Such attention occupies but a few minutes of the shepherd's time and will result in steady thrift on the part of the lamb. The principal danger, however, is from the shepherd's mistaken kindness in attempting by extra allowance of feed to suddenly stimulate the ewe to even greater milk flow. Sudden changes of feed should never be given to ewes, and at this time they are especially harmful. It is better for the ewe and for her lamb if she be a trifle hungry for a few days after yeanning, and it will be readily seen that in a state of nature where she would go to some secluded glen to bring forth her lamb, she would from the very fact of the feebleness of her offspring, be forbidden to wander much, and thus would consume but little feed for several days. There is not much danger of her eating too much hay at this time, and it need not be limited, but it is better to give her no grain at all until such time as the lamb can take all of her milk. So fast as the lambs get strong enough to be taken away from the small pen, they should, with their mother, be placed in a separate compartment of the sheep barn, so that they may have especial care and treatment fitted to their needs.

There is one other grave danger in suddenly increasing the food of the ewe after lambing, and that is of garget or caked udder. This garget seems to be induced by some derangement of the digestion, caused doubtless by poisonous matters being carried through the blood, and favoring the development of the peculiar germs that cause the garget. The writer has known a number of cases where garget suddenly followed the abrupt change to heavy feeding of grain to milking ewes. He regrets that he has not much helpful advice to offer to anyone so unfortunate as to have garget in his flock, not having found any of the prescribed treatments to be particularly efficacious in his own practice. About half of the ewes will die, and the others will lose a part or all of the udders. Perhaps the local application of hot water is as good as any as can be given, but where the affection assumes a virulent type, nothing seems to avail to check its course. A little care, however, will obviate nearly every case of this disease. It is not, as has been thought, usually induced by failure of the lambs to take away the milk. Garget is now considered a germ disease, but how the germ finds lodgment, or under what conditions it becomes active, are facts not yet clearly understood. After a time when the lamb is able to take all of the milk and the ewe shows by her eagerness for food that she needs more nourishment, she should be given a larger allowance, but this of course should be slow and regular, so that at no time will she feel a sudden increase of food to be digested. The character of the food for the milking ewe should be very similar to that given to the dairy cow, remembering always that milk is largely composed of protein, and there is no chemistry within the body of the ewe that can create protein from carbo-hydrates; so that whatever is fed to her will in the process of digestion and assimilation be available for milk just in proportion as it approaches the constituents of milk. Here clover and alfalfa hay will again be the basis of the ration, with help from soy beans if they are available (and they are readily grown in Pennsylvania), with wheat bran, oats, oil meal or gluten meal, any of which are rich in protein, that vital element for the mother and her baby. Timothy hay

is perhaps the poorest thing that can be fed to sheep, and especially to suckling ewes, as it contains almost no milk at all, while alfalfa hay is the best of the forage plants. Oats are far better than corn, wheat bran better than oats, and bran should be a constituent part of every ration when its cost is not prohibitive. Oil meal may be cheaper than wheat bran, considering its protein content, and soy beans which contain nearly twice as much protein as oil meal, may, if farm raised, easily be the cheapest of all sources of protein. As the lamb grows rapidly and makes greater and greater calls upon its mother for milk, the amount of food given her may be increased day by day until finally she is consuming nearly all that she desires, and it will be found that she will turn it almost all to milk. In fact if she is a well bred ewe of the generous milk-giving type, it will be found difficult to feed her enough to maintain her weight for a few weeks after lambing, seeing that her very body will dissolve itself into milk, and be yielded up to her offspring. Care must be taken here, however, that this feed be not too expensive to yield a profit, and to cut down this expense the shepherd should provide from his own farm as much of it as possible. This he can readily do by growing his own clover and alfalfa, his soy beans and oats. And when he has provided a silage or roots also he has done his part, and may well laugh at the miller and purveyor of food stuffs. The well born lamb, nourished so prodigally by its mother, soon finds kindling within him an ambition to do some eating on his own accord, and nibbles at hay and looks about seeing what he may devour. The shepherd must now take advantage of this youngster's appetite, and seek to teach him as soon as possible to eat on his own account. In order to do this effectively he must provide

A LAMB CREEP.

The creep is simply a small room or portion of the floor penned away from the ewes, with small apertures through which the lambs can pass, and not large enough to permit the ewes to follow. It may be made of slats like a picket fence, spacing them seven or eight inches apart, according to the size of the ewes. This creep should be placed in the spot most convenient of access in the barn, so that it is really easier for the lambs to go in it than to stay outside. The reason for this is that lambs are such foolish things and have such short memories, that unless their creep and the feed within it are readily accessible they will neglect to eat as often and as much as they should. In fact the difference in the quality of the lambs coming from a well-placed creep and from one inconvenient of access is very marked, and might easily amount to many dollars in the course of the season. This creep should be so placed that the sun will enter it, for lambs revel in sunlight like young plants. In this creep should be some flat-bottomed troughs, high from the ground, with boards over them placed like an inverted "V" so that the lambs can neither stand upon them nor put their feet in them. This cover may be put up 6 inches to enable them readily to thrust in their heads. In these troughs must be put a mixture of ground grain, and the lambs induced at the earliest possible moment to partake thereof. The writer has often practiced

the catching of the larger lambs when two or three weeks old, and carrying them to the troughs, handling them so gently as to awaken no alarm, and putting them down beside it, placing a little food in their mouths, when presently they will get the taste and begin eating of their own accord. After one or two have found the feed, the others will by imitation soon follow, until all will be eating greedily as little pigs.

The writer has found it a good practice sometimes to sprinkle a little coarse brown sugar over the grain to induce them to eat it at a very early age. The main ingredient of the lamb's ration must be wheat bran, which should be freshly ground, preferably from the local mill, seeing that it is more palatable than that which has been stored in bulk. To this must be added cracked corn not finely ground, with oats, a trifle of oil meal or of soy beans. This ration is elastic and may be varied according to what is required of the lambs. Should they be destined for very early slaughter, as 'hot house' lambs, bran, corn and soy beans will make them very fat at an early age. This ration would, unless the corn was restricted, be unsuitable for lambs intended to remain upon the farm, or to be sold as breeders, seeing that it would develop an extreme degree of fatness at too early an age, and these lambs pushed thus to premature ripeness would never thereafter make as strong and valuable sheep. Not that there is any danger of developing the muscle and bone of the sheep too fast, but upon the ones destined to live their natural life one should avoid putting on too much juvenile fat.

There are, of course, many combinations of rations that would be suitable for these suckling rams. One that occurs to the writer that he has often used in his own practice is a mixture of corn, bran and oil meal, giving the following proportion: 40 lbs. of coarse cracked corn, 40 lbs. of wheat bran and 20 lbs. of coarse ground oil meal. To this may be added any amount of oats desired, seeing that oats themselves contain an almost perfectly balanced ration. And if soy beans are available they may constitute about 10 per cent. of the ration with excellent results. The manner of feeding these lambs is important. They have very delicate appetites and sensitive nostrils, and the least mussiness or filthiness in the food is resented by them, so that it is better to put it in twice every day, taking out all that may be left over and feeding it to the ewes. The prospective shepherd may hesitate at the thought of giving the lambs this generous treatment at so early an age, but indeed a pound of food given the lamb while suckling his mother will make as much gain as ten pounds would make fed some months later, and the trifling amount of time and care consumed in this work is repaid many times over. Besides this the lambs early ripened in this manner command very fancy prices, and come into the market at a time when they are not competing with the flood of cheaply raised lambs from the western ranges. Besides the ground food mentioned, the lambs relish very much ear corn, and like to shell it off themselves grain by grain, and it is best to feed them quite a little in this way. After that they will soon take it so readily from the ear that the shepherd may cease to give the cracked corn altogether, and feed only the bran, oats and soy beans in their trough. Beside the grain fed, the lambs should have

all the nice early cut and well cured clover and alfalfa hay that they will consume and all the water they will drink, that also as clean and pure as though for human drinking. The ewes also will require large amounts of water at this time, and careful attention to these details is necessary. Exercise is not particularly essential to either ewes or lambs when the lambs are to be sold fat at the age of a few weeks. In fact too much exercise will cause a muscular development, and the lack of fat will be fatal to this aim. However if the lambs are pure bred, or are intended to remain during their natural lives upon the farm, they should be permitted and encouraged to roam the fields and take all the exercise they will. Fresh air and sunlight are both absolutely essential, and better a cold barn well aired than a warm one close and illy ventilated.

There are a number of troubles that sometimes afflict the little fellows during the first few weeks of their life. One is sore mouth. This affliction is characterized by little scabs along the edges of the mouth and upon the lips, these scabs being quite sore and interfering with eating. Similar sores and scabs will appear upon the teats of the ewes, and doubtless they are communicated from one to the other. Authorities seem to disagree as to the cause of this ailment, and some gravely prescribe physic and internal medication as a cure, but the writer has never found anything necessary except to rub off the scabs and apply to the sore surface some of the coal tar sheep dips, using them in a raw state, and merely wetting the surface of the sores. Of course one should not use enough to injure the lamb by making it swallow any of the medicine. This treatment quickly destroys the germ which is the undoubted parent of the disease, and in a few days the mouth is sound and well. The same treatment applied to the ewes' teats will effect a speedy cure. Sometimes sore eyes become epidemic with the lambs, and this also proceeds from some germ or other, and the cure is along the same line as indicated for the sore mouth; merely to wash the side of the head with a strong solution of carbolic dip, and see to it that a little of the liquor penetrates to the ball of the eye, where by the violent winking of the lamb it is carried to every part and almost an immediate cure will result. With all these little ailments a stitch in time saves many times nine.

This course of heavy feeding to very young lambs may seem an unnecessarily expensive thing to the novice, who would be inclined to feeding more savingly and thus lengthen out the time required to bring the lambs to maturity. Let him be assured, however, that it is because of the greater cheapness of this course that it is recommended, seeing that at this very early age the lamb's digestion and assimilation are so nearly perfect that every atom of food given goes to a useful purpose, and in the homely phrase of the shepherd, "It sticks to the ribs." The old-time method of slow development and of long keeping the lambs while they attain growth is unprofitable to-day when compared with the modern method of supplying at the time when best the lamb can use it what nutrition it desires. Lambs thus pushed forward will soon be ready for market. If they are born at a very early season, say in December, January or early February, they will, at the age of six or eight weeks,

be fat for the fancy "hot house" trade, and when properly dressed, command in the New York and Philadelphia markets, very long prices. "Hot house" lambs (the term "hot house" being merely a distinguishing name, and not meaning that they are to be grown by artificial heat), do not sell by weight, although the market requires them to be between 35 and 50 lbs., but are sold on their merits strictly as shown by their fatness. Thus a very strong and very fat lamb may sell for \$10.00 or \$12.00, while an older one, heavier, but not so fat, may sell as low as \$3.50. Even if the lambs are not born early enough to be fed for this fancy trade, they will pay well if they are fed a little later on. They may be pushed right along until grass comes, and then after the grass becomes sweet, finished upon grass with ear corn or other grain fed very much as little pigs would be.

There is no excuse for the rearing of lambs according to the western ranch methods, in Pennsylvania, nor will it be found profitable to grow them in a similar fashion, bringing them to market at the same time when the western lambs come, and thus competing directly with the man who does not own his land nor need to provide much winter feed, but who grows his lambs by the thousands at the lowest cash outlay.

FATTENING EWES AND LAMBS TOGETHER.

Fed as we have indicated very generously during the period of suckling their lambs, the ewes will begin, after the lambs are some weeks old, to lay on flesh quite rapidly. The shepherd can take advantage of this fact if he has a lot of old ewes that will presently leave the farm, and continue to push these ewes forward, so that when their lambs are sold, after a few weeks of further feeding they will be ripe for the market. This indeed is quite a favorite practice with some successful shepherds who buy a new set of ewes each year, taking from them but one crop of lambs, or from some of them two crops, and sending them all to market in a continual procession. There is danger indeed unless the shepherd is watchful, that as the ewe's milk flow diminishes, she will, unless the food is decreased, gain in flesh to her detriment. Supposing she is to remain upon the farm another year, it is not desirable that she should become very fat at this season, seeming that she has the entire long summer in which to recuperate, and as excessive fatness would diminish her value as a breeder and perhaps prevent her from breeding again at all. Therefore as the lambs get older and the ewe's milk diminishes they should be fed a little more sparingly. It is not necessary, however, to limit them in the amount of good sound hay consumed, and such foods as silage, and roots, having a tendency to stimulate milk flow without laying on much flesh, are very suitable at this time.

CARE OF EWES AFTER TAKING AWAY THE LAMBS.

Supposing that the lambs are taken from the ewes before they are weaned; it is often best to give to the ewe another lamb, one perhaps of a pair of late-dropped twins. This is not very easy of accomplishment, seeing that the ewe by long companionship with her older lamb has become acquainted with its size and character-

istics so thoroughly. The writer has found it best to make no effort toward persuading her to adopt the stranger, but to confine her head at once in a pair of stanchions and let the lamb nurse whether she will or no. A few days of this treatment, reconciles her to her foster child and all is well. Supposing that there is no other lamb to take her milk, she should be removed from the company of her sisters and given for a few days a feeding of good oat straw or timothy hay without grain or succulent food. Thus after milking her out once or twice and withholding the milk-making foods, she will cease to secrete milk at all.

SPRING CARE AND MANAGEMENT.

After the advent of warm days in March the ewe flock will begin to feel oppressive their heavy fleeces, and if well fed during winter, they may begin to shed their wool in patches, especially along the neck, caused, no doubt, by some irritation from chaff or seeds getting next the skin. It is a wise plan to shear the flock as soon as warm weather comes in March or early April, provided that there is fairly suitable shelter given where they may take refuge from the storms that will occasionally come as late as May. The writer is aware that this early shearing is contrary to the practice of old shepherds, but having practiced it upon his own flock for many years without ever having had cause to regret it, he unhesitatingly commends it. It may be thought by some that by shearing thus early there will be secured less weight of wool than if the shearing were delayed for a month or two. Taking, however, a series of years into consideration, this will not be found true, and as much wool will be secured by shearing in March as by shearing in April or May, and probably a little more, owing to the greater thrift of the sheep, induced by their comfort under the better conditions afforded by the removal of their burdensome fleeces. There is another reason why this early shearing is desirable, and that is that it causes the ewes to come promptly to shelter whenever it storms, which they will not do if they have on their winter's fleeces, indeed the full fleeced sheep is hardly aware that rain is falling until it is thoroughly wet through, after which it requires many hours to again become dry, and ewes will most provokingly remain out in the storm, keeping their lambs with them when the whole flock would be better off under roof, and after the fleeces are taken away, they will upon the first downfall of rain or snow, fly to the shelter, taking their lambs with them. It is well if the shepherd can personally do the shearing of his ewe flock. It need not be done all at once, and even if he can shear but 25 sheep a day, he will soon get over an ordinary flock. The shepherd will naturally handle the sheep more gently than a hireling would, and in the process of shearing he learns more fully than he had known the bodily characteristics of each ewe, becoming better acquainted with her form and condition than he had been. He may, if a careful man, shear so close and carefully that each stray tick that may happen to be present, will be cut in two by a clip of the shears, and thus if there be put a half dozen in the flock, they can be destroyed and their increase prevented.

USE OF THE HAND SHEARING MACHINE.

The use of the hand shearing machine is to be commended to the man who shears his own sheep. These machines are now so well perfected that they do very excellent work, cutting far smoother and closer than is possible with hand shears and not making any incisions in the skin, whereas old experienced shearers will shear more rapidly with the hand shears than with the machine, but the reverse is true of the inexperienced men. He will shear three sheep with the machine, with less labor, than he would shear one by hand. However, if one must hire old shearers to do the work, he had better allow them to use their accustomed tools.

WHEN GRASS COMES IN SPRING.

It is easy to make a serious blunder when first green grass comes in the spring, for the ewes that have been roaming the fields during the winter now find this quick-springing young grass so tender and delicious that they are very eager for it and neglect other food in order to seek it. There are two evils resultant from this practice. First, the ewes get little or no nourishment from the grass when first it springs green, and next, the grass itself is prevented from growing, so that a given amount of pasture grazed thus early will not return more than half the sustenance that it would, if allowed to get a start before the stock is turned on. It is wise, therefore, to confine the flock to their yard as soon as grass begins to green, and notwithstanding their calls and longing glances pastureward, to compel them to eat dry food until the grass has actually made good growth and the sun has had time to get in it and sweeten it. Upon the western ranch, where the author once resided, cattle ate only sun-cured wild grasses in winter and thereon maintained good flesh, when green grass came in spring, however, they forsook the search for the dry and rather tough grasses of the previous year's growth, and sought only the fresh-springing green stuff. The result was that they rapidly lost flesh and strength so that death from starvation sometimes resulted at the very time when the novice would have considered his troubles over. After once the grass has grown sweet and strong it is great delight to turn the flock to pasture, and wonderful are the gains that both ewes and lambs will make during the cool days of May and early June, with the conditions perfect of both temperature and food, without the fear as yet, of internal parasites afflicting the flock. The ewes, of course, will need no grain when upon the grass, but the lambs will make very large return for corn or oats fed them in connection with this grazing. The writer has practiced feeding ear corn in "creeps" made by setting hurdles about the corner of the pasture, for lambs born too late to go away dressed, and these lambs have made marvelous gains at very slight expense of grain at this time. One lot born in March, averaging above 80 lbs. on the 8th day of June when they sold for something more than \$5.00 each, at home. These lambs, had they not been pushed from growth, would have remained in his care all summer and in the fall would have weighed perhaps 80 lbs. and have been worth less than \$4.00 each, beside having had to run the gauntlet

of the summer's terrors, including flies, ticks, and worst of all, internal parasites. Excepting upon the poorer mountain pastures of Pennsylvania, therefore, the writer urges that all lambs be fed and finished for market before the first days of July, feeling sure that by this course will be secured the greatest profit and avoided the most potent sources of danger. The writer concedes, however, that there are locations at high altitudes where grass is more abundant than grain and where spring comes later than in the valleys, where a different course of management may be advisable. There the flock may be most cheaply wintered upon hay with corn stalks, and it may not be expedient to have the lambs born much before grass comes in the spring. Certainly they should not come before means are at hand to feed well both ewes and lambs, since the neglected lamb, if it becomes stunted in its early youth, will not make as heavy weight as another one born some weeks later under favorable conditions, when both it and its mother are well nourished. When lambs, therefore, must perforce rough it, they should not be born until after grass has come to fill their mother's udders. It is sometimes practicable to feed these lambs grain upon pasture, but under such conditions it is probable that usually the greatest profit will come from giving merely good management upon pastures and this we will consider under the head of

SUMMER MANAGEMENT.

Winter with its terrors is really easily managed, and not until summer, with its relaxation and apparent cessation of troubles appears, is the flock in any real danger, except from starvation. The summer time brings nearly all that goes to wreck and ruin the American flock, for with summer conditions comes foot rot, flies and the deadly internal parasites. This need not be true, and by a very little care and labor rightly expended the flock may be made to thrive as well in summer as in winter, or even better. The trouble American flock, for with summer conditions comes foot rot, flies comes from lack of skilled shepherding, and from the fact that the flock once upon the pasture is supposed to shift for itself. Certainly nothing could do finer than the flock will probably do during the flush grass of May and early June, after that time disaster may come all unawares.

FOOT ROT.

The first danger is from foot rot, and many shepherds are unwilling to admit that they have foot rot among their sheep, preferring to call it by some harmless name, such as "foot scald," though it is probable that nearly all affections of the feet are similar in character and all attributable to some germ that, finding its way beneath the hoof of the foot, burrows there, escaping thence to the soil in some wet place, or to the foul footing of the shed and is communicated to others of the flock until perhaps it has spread widely. This trouble is worst among certain breeds, affecting more often the Merinos than the English breeds, although probably no sheep are exempt from it. It has driven many a shepherd to sell his flock in despair, because of his inability to cope with it and hold it in check.

It is not necessary to yield to this disorder, seeing that a stitch in time here will also save nine hundred. Upon the first appearance

therefore of lameness in any one of the flock the shepherd should promptly seek to ascertain the cause, which may be from a thorn or injury of some nature, but he should make careful examination to see that it is not from the beginning of foot rot. Two or three times each year the feet should be trimmed to cut away the superfluous hoof, down almost to the quick, taking care not to actually draw blood. Nature has provided a great growth of hoof upon a sheep's foot for the purpose of affording it material for wear upon rocky trails, and in our soft pastures there is seldom enough grit to keep the foot properly worn down. Nevertheless, simple trimming alone will not prevent the entrance of germs of foot rot. When trimming the foot of a lame sheep, by using great care, and after a little experience, one can readily locate the place where the germ has found lodgment beneath the hoof, and there he will find a small amount of watery fluid having an offensive odor. All the horn hiding such places must be cut away, so that whatever remedy is used may come into direct contact with the diseased tissue. This requires a little nerve upon the part of the operator, and if the case is of long standing, may give the sheep some pain. Once the seat of the injury is laid bare, it is a simple matter to apply the proper remedy to eradicate the disease.

Several preparations are in use and have proved effective, among them a strong solution of blue vitriol, is possibly as good as any, although the writer has found Butyr of Antimony to be the most penetrating and certain of anything that he has used. Having treated the lame sheep, however, the shepherd's duty is only just begun, for well assured he may be that others in the flock will be infected from having traveled over the same ground, and sooner or later others in turn become lame, so that if treatment is only given to those showing lameness, the eradication of the trouble may be very difficult. There should then be provided a trough, say 12 feet long, 6 inches wide at the bottom and about 12 inches at the top, and this trough placed between hurdles in some convenient location so that the flock may be readily driven through it. The writer has found that to place it as an exit from the barn gives convenient use, seeing that the sheep may be penned in the barn in the morning and permitted to quietly walk out through this trough in the afternoon when they desire to get grass, thus each foot may be treated every day for several days with no outlay of labor on the part of the shepherd. In this trough may be placed a solution of blue vitriol with common lime whitewash, which is of itself a disinfectant against foot rot. The solution may be two or three inches deep, and thus each foot will become well coated as the sheep passes through. It is not meant to suppose that those actually lame will be cured by this careless treatment, seeing that the solution would hardly penetrate without more help to the diseased tissues. No one need be ashamed to have an occasional outbreak of foot rot in his flock, although it is a disgrace to a shepherd to permit it to remain after being discovered. There is another lameness sometimes observed among ewes that have gorged themselves with too much grain, causing them to go upon their knees. This is probably akin to founder in horses and should not be confounded with foot rot.

THE BLOW FLY.

As has been said, the shepherd should see the sheep every day, and indeed in Scotland upon the hill pastures, the shepherd aims to see each member of the flock twice every day. One of the terrors to which they are exposed is that of the blow fly, which, finding some foul or wet spot upon the wool, deposits its eggs. These hatch and crawling down next the skin the maggots gnaw until they have caused a watery exudation from the irritation, and set up an odor that at once attracts more flies, so that in a short time the poor sheep is a terrible object, having a great patch just beneath the wool filled with myriads of hideous, wriggling maggots. Sometimes where the spot is within reach of her mouth she will tear off the wool and in a measure rid herself of the pests, but more often the trouble spreads until the poor beast is literally devoured alive. The prevention is to shear early and to have a clean place for the sheep to lie in the cool shade during hot summer days, to see that no part of the body becomes fouled and should she, from violent rain, become wet enough to be struck by maggots, to promptly rout them by the application of turpentine, or pouring on a quantity of sheep dip as though treating scab. The unfortunate sheep should not, however, be permitted to go away from the sight of the shepherd for a few days, lest the flies re-infest the same spot before it has entirely healed. When lambs' tails are docked late in spring there is danger of the same trouble there, so that they should be coated with pine tar upon the stumps and then given careful watching for a few days.

PREVENTION OF PARASITES.

While the writer feels that all the cautions he has endeavored to give have been well deserved, yet in his estimation, all of the other dangers to which the flock is subject pale into insignificance when compared with the danger of infection from internal parasites. These have wrought more ruin to American flocks upon arable farms than have all the dogs, politicians, scab germs, tariffs and blow flies put together. And it is safe to say that a shepherd who once masters the question of internal parasites and learns to keep his flock always free of them will find his other troubles trifling, and remain in the business content with his profits and deriving great satisfaction from his occupation. Whereas, the unfortunate shepherd who does not believe in parasites, or believing, neglects to do as well as he knows, will be doomed together with his flock to much sorrow, tribulation and loss. Sheep are subject to a large number of internal parasites, although but two or three give sufficient trouble in our land to deserve attention. These are the nodular disease, tape worm and the stomach worm (*Strangylus Contortus*.) Of these the last and smallest is easily the most deadly, and has wrought damage in the United States of millions of dollars in the past, and is to-day continuing its unseen but deadly work. The nodular disease is caused by a worm which inhabits the intestines and attacking their walls, deposits eggs in the tissue about which a little swelling or tubercle is formed, called a nodule. This nodule has in it a greenish, cheesy mass in the midst of which the young germ is developing. These nodules spreading over the surface of the intestines diminish their power of absorption and finally with

interference in assimilation and digestion, work great injury to the sheep. The nodule disease does not spread with great rapidity through the flock, but once having foot-hold, continues to increase steadily from year to year until at last so much infection exists that profit is no longer possible from that flock. It causes the condition known to butchers as "knotty guts," which unfits the intestines for sausage casings, and the packers will tell you how few of the eastern grown sheep sent to market are free of this trouble. Treatment for the nodular disease is quite impracticable, owing to the position of the encysted parasites, and prevention the only feasible course in fighting them. As the prevention of this trouble will be of a similar nature as that for the prevention of stomach worms, we will consider them together.

THE STOMACH WORM.

The stomach worm is a tiny hair-like worm about three-quarters of an inch in length that inhabits the fourth stomach of sheep. No one should permit a sheep or lamb to die from any unknown cause upon his farm without promptly dissecting to ascertain the reason, and in this dissection, search through the tract of the alimentary canal will, in ninety-nine cases out of a hundred, reveal the cause. Beginning with the paunch or largest receptacle of food, which is in the nature of a storehouse where quickly gathered food may be held, until re-masticated, and passed on, the operator should seek for evidence of impaction, or for the presence of foreign matter in some cases, such as hair balls, wool or possibly nails, although these are more apt to be found in cows. Passing on now from the paunch through the other stomachs the operator must scan very closely the contents of the fourth stomach just where it joins to the intestines, and here swimming about in the dark colored fluid found therein he will probably find from a few to a myriad small wriggling worms. Their appearance is altogether too insignificant to explain the great havoc that they work, but there is no doubt of the results they are capable of achieving in the ruin of the health of the sheep, and especially of the young lambs. Having passed the fourth stomach the intestines may next be examined for the little bluish "knots," or nodules upon their surface, and then search may be made for tape worms, which are, however, rare visitants of any flock while fed upon pumpkins as described earlier in this bulletin.

The work of the stomach worm, however difficult it is for us to understand, is very disastrous to the lamb or immature sheep, and does quite sufficient damage to mature ewes so unfortunate as to be afflicted. The first symptoms of infection will be a general loss of thrift with a paleness about the eyes and depraved appetite, perhaps ceasing to eat or else eating ravenously at times, and a desire for abnormal articles of food such as rotten wood or earth. If the shepherd will catch the sheep and part its fleece and observe the skin, he will find it pale and chalky, which fact has given the disease the name of "paper skin." This paleness, however, is but a symptom of the general anemic condition of the animal, and is not at all the seat of the disease. The natural progression of the disease is from one stage of debility to another until death comes to end the strife, although when a less degree of infection exists it will simply cause a loss of thrift and profit.

Prevention of the stomach worm parasite is not difficult, but the violation of certain laws of management for even a few times during the summer may bring disaster. It is not certainly known how long these parasites exist within the body of the sheep, but at some time they mature and being filled with eggs about to be hatched pass out and fall on the ground. Now it is not definitely known how long these remain upon the ground alive before they must again find entrance into the body of another sheep or lamb. It has been thought they might live a year or more upon the pasture, possibly, within the bodies of earth worms, but later experience seems to indicate that the time elapsing between the expulsion of the young germs from one sheep and its entrance into the stomach of another is of comparatively few days' duration. The stomach worm is carried over winter in the stomachs of the mature ewes, by them dropped upon the grass in early summer, then taken into the stomachs of the lambs as they crop the short, sweet grass that naturally grows where many of the droppings are deposited, and thus its life cycle goes on. It has been stated with some degree of reason that a temperature of 50 degrees is fatal to the stomach worm lurking in the grass or upon the ground. This fact, if it be true, would explain the ability of Scottish shepherds to maintain for centuries great numbers of sheep upon their thickly sodded mountain pastures without loss from these parasites. In American pastures, however, between the 10th of May and the beginning of October, the ground would seldom get as cold as 50 degrees, therefore, between these dates infection is easy and results correspond with this theory. In southern England the shepherds must always be on guard against this parasite, which they do by seeing to it that the lambs do not graze behind their mothers, but have always a fresh bit of grass hurdled off for them on which they run forward, the ewes following the next day and consuming what the lambs have left. In Dorsetshire, an old shepherd told the writer that lambs must never sleep two nights upon the same ground. This same old shepherd had set hurdles about a great oak tree so that the sheep could not go beneath it, this being in permanent pasture and the sheep dry ewes. Upon being asked the reason for these hurdles he gave a characteristic answer, showing his knowledge of facts but his ignorance of the true theory thereof. "The sheep do love to lie beneath the tree, sir, and the wind do blow and the draft makes them cough, sir." The real truth being that beneath this tree with the constant accumulation of infected droppings, green grass sprang up thick and sweet and sheep grazing it rather than go out into the sunny open would take in many parasitic germs which would cause them to lose thrift and to cough. In our own land the prevention of infection from stomach worms consists, as has been directed, in having the lambs born early enough so that they may mostly go to market before the danger period has set in, and for those that are to summer upon the farm, the separation as early as practical from older sheep and putting them alone upon fresh pastures either of crops especially sown for them or upon grass that was not grazed by another sheep for some months previously. This treatment will surely ward off the insidious foe of the stomach worm. There is another point in summer management that works toward good health in the

flock and that is to encourage the ewes to shade in the barn or some cool, airy, dark shed, rather than to shade under trees or along fences, thus during our summer heats when the period of danger from infection is worst they early seek the shelter of the barn and deposit all their droppings there, and do not infect the grass as they surely will if they shade promiscuously beneath the trees or along stone walls or fences.

Perhaps the most practical method of warding off the attacks of parasites, is the pasturing of sowed crops, such as oats or rape, or a mixture of the two, or the pasturing of alfalfa sown with brome grass (*bromus inermis*). Any one of these crops is usually bitten off higher up from the ground than is blue grass or white clover and therefore there is much less danger of taking an infection. The writer after many seasons pasturing of alfalfa has never had a single case of infection arising among the sheep thus treated. A surer method of prevention consists of confining the lambs to an airy barn, basement or shed and soiling them with green crops cut and fed fresh every day. This method is really much more practical than might at first be supposed, seeing that from a given area much more feed is secured, and many more animals may be kept thus than when they are allowed to run over the fields, eating too closely in spots and wasting other spots by trampling it down. The writer has seen in France great numbers of sheep kept upon the larger estates in the central valleys near Paris, by this system of soiling in their great, cool, airy, stone built sheds. The sheep eat from racks, green clovers with the bloom on, straw threshed fresh every morning, of which they consume little save the weeds and leaves upon the stalks, a small amount of roots with possibly a taste of grain. Wonderful is the thrift of these flocks, and never a trace of parasitism anywhere, although the climate and luxuriant vegetation would as certainly invite parasitic attacks as in our own land. Something may be accomplished by treating the ewes before going to pasture by ridding them of the egg-bearing worms that would otherwise infect the ground. Several systems of medication have been advocated and nearly all of them abandoned, so that at present we seem to be given choice between two things, the use of coal-tar creosote and gasoline. Circular No. 35, of the United States Department of Agriculture, Bureau of Animal Industry, by Ch. Wardell Stiles, Ph. D., Zoologist of Animal Industry, contains a valuable account of treatment for these parasites, from which we quote:

COAL-TAR CREOSOTE.

"I have had excellent success in treating sheep, goats, and cattle for the twisted wireworm (*Strongylus contortus*) with a 1 per cent. solution of coal-tar creosote. The medicine is easily prepared and quite inexpensive. It may be purchased of the druggist in small quantities of one ounce, or in pound bottles. One ounce is sufficient for about 20 adult sheep, and the cost of the treatment is less than one-half a cent per head; if creosote is purchased by the pound, the cost is reduced to less than one-quarter of a cent per head. If creosote is called for at a drug store, beechwood creosote will usually be dispensed. This is more expensive than the coal-tar creosote and not so satisfactory in expelling worms.

"A 1 per cent. solution of coal-tar creosote is made as follows:

Coal-tar creosote, 1 ounce.

Water, 99 ounces.

99 ounces=6 pints and 3 ounces.

"Twisted wireworms (*Strongylus contortus*) taken directly from the stomach of sheep or cattle die in one-half to one and a half minutes when immersed in this solution.

"If, in dosing, this liquid enters the lungs the animal may succumb in a few minutes. If the dosing is performed carefully, as much as 6 2-3 ounces may be given to a full-grown sheep without fatal results. In some cases, however, the animal shows ill effects, from which it usually recovers within half an hour. Six ounces were given to a number of sheep without the slightest ill effects. The following table gives the doses of the 1 per cent. mixture which were used in about 400 cases without ill effects:

Lambs, 4 to 2 months old, 2 to 4 ounces (about 60 to 120 c. c.)

Yearling sheep and above, 3 to 5 ounces (about 90 to 150 c. c.)

Calves, 3 to 8 months old, 5 to 10 ounces (about 150 to 300 c. c.)

Yearling steers, 1 pint (about 480 c. c.)

Two-year olds and above, 1 quart (about 960 c. c.)

"Sheep, goats and calves which received this treatment showed a marked improvement a few days after receiving a single dose. In experiments with creosote at Washington, D. C., sheep were drenched with a 1 per cent. solution and killed immediately afterwards. Upon opening the fourth stomach, it was found that the wireworms present were dead. In some cases where this was tried later, the wireworms were found to be still alive; but it is believed that the explanation of this fact has now been discovered (see below page 59.) Creosote does not appear to have much effect upon the worm below the stomach.

"If an overdose is given by mistake, and if the sheep appears severely affected by it, the animal should be placed in the shade. Even in some cases of very severe overdoses, where the animal is given up for dead, practically, it may entirely recover within an hour or so

COAL-TAR CREOSOTE AND THYMOL.

"If, in addition to the stomach worms, the animals were suffering from severe infection of bowel worms, such as the hook worms, better results were obtained in the treatment when powdered thymol was added to the creosote. In cases of this kind, the creosote solution is prepared, as directed above (page 1), and 30 to 80 or even 100 grains of thymol added to each *dose after it has been measured*.

"Thymol is expensive, the price varying in different parts of the country. It may be purchased by the ounce, but it is considerably cheaper if purchased by the pound. Avoid using thymol which has become yellowish or reddish and which has run together in the bottle so as to form a solid mass. Powder the crystals and have the druggist measure 30 grains. Give 30 grains to a lamb, about 50 grains to a yearling, and 70 to 80 or 100 grains to older sheep, according to size. In experiments I have had excellent results with a single dose of the creosote and thymol mixture. If necessary, however, the dose could be repeated after a week.

GASOLINE.

"Gasoline has gained considerable reputation as a vermifuge. Three objections, however, arise to its use, and I cannot, therefore, consider it an ideal treatment. These objections are:

(1) Not less than three doses, and usually four to six, are required to expel the worms. Its use involves a great expenditure of labor, and it is therefore impracticable on the large ranches.

(2) While several doses are not necessarily injurious to the stock, still, if the doses are large, repeated drenches cause a more or less severe congestion of the bowels. Not only that, but repeated handling of range sheep, with the necessary preliminary treatment of withholding food, is injurious to the animals.

(3) If used on animals suffering from pleurisy, it is likely to be fatal. I have had several fatal cases of this kind.

"Nearly all vermifuges are, however, more or less poisonous in one way or another, and gasoline, if properly used, is not particularly dangerous. The necessity of repeating the dose from four to nine times in order to effect a complete cure will, however, militate against its general adoption.

"If gasoline is used, ammonia also should always be kept on hand. If an animal is suddenly overcome by the effects of gasoline, a small amount (a teaspoonful or so) of aromatic spirits of ammonia may be given in water as a drench, to be repeated if necessary, and will usually result in the recovery of the patient. The usual doses of gasoline for stomach worms are:

Lambs,	$\frac{1}{4}$ ounce.
Sheep,	$\frac{1}{2}$ "
Calves,	$\frac{1}{2}$ "
Yearling steers,	1 "

"I have used these doses repeatedly without any serious effects. Each dose is mixed separately in linseed oil, sweet milk, flaxseed tea, or an egg, and given as a drench. If given directly in water, it is more severe on the patient.

"An ounce and a half of gasoline has resulted in the immediate death of a full grown ewe, but in some cases I have given to full-grown sheep as high as 2 to 3 ounces without serious results. I have also given as much as 3 ounces to a yearling steer, and 7 ounces (within an hour) to a horse without causing serious symptoms. I have also given 3 ounces to a full-grown chicken; the animal became very stupid for a time, but eventually recovered. On the other hand, in one case, a yearling steer, in apparently quite healthy condition, succumbed within two minutes after a dose of $1\frac{1}{2}$ ounces. These large doses were given experimentally to determine the danger point, and they should never be used by farmers in treating stock.

"In one instance a steer was suddenly overcome because the man who was administering the dose for me accidentally held the head too high and the medicine entered the lungs. The animal fell immediately and appeared to be almost dead. I happened to have a hypodermic syringe with me and some tablets of sulphate of strychnine. A hypodermic injection of this substance was immediately

given and within five minutes the animal was feeding as if nothing had happened. This incident led me to overdose several animals with gasoline and then try to revive them with hypodermic injections of strychnine. In all cases the treatment was successful. It is thus seen that injury from gasoline may be counteracted by either aromatic spirits of ammonia or by strychnine.

METHOD OF DRENCHING ANIMALS.

"The popular method of drenching is with a bottle. The use of a drenching tube is, however, far more necessary. A drenching tube may be made by taking an ordinary tin funnel, which may be purchased for five or ten cents, and inserting the narrow end into one end of a rubber tube or hose, say three feet long and three-eighths of one-half inch in diameter; into the other end of the rubber tube is inserted a piece of three-eighth inch brass or iron tubing about 4 to 6 inches long.

"The metal tube is placed between the animal's back teeth, and the sheep or calf is allowed to bite upon it. The water or drench is poured into the funnel, which may be held by an assistant or fastened to a post at a convenient height. The man who holds the metal tube between the animal's teeth can control the animal's head with the left hand, and by holding the tube in the right hand, near the point of union of the rubber and metal tubes, he can easily control the flow of the fluid by pinching the rubber hose. Care must be taken not to hold the patient's nostrils closed, otherwise the dose will enter the lungs.

"It is usually advisable to fast animals 12 to 16 hours before dosing.

POSITION OF THE ANIMAL DURING DRENCHING.

"Different persons prefer to hold the animals in different positions during drenching. Thus (1) the animal may be left standing on all four feet; or (2) it may be placed on its haunches, one man holding its back up against his own body; or (3) it may be placed directly on its back on a sloping piece of ground, its head being in a direct line with its back, and higher than its rump; or (4) it may be placed upon its side, the head being brought around so that the horns are squarely on the ground; the operator may then place one foot on one of the horns (especially in the case of semi-wild cattle) and thus aid in holding the animal still.

"So far as administering the doses is concerned, the position on the back (3) is by far the easiest in the case of sheep, and the side position with head down (4) is the easiest in dosing cattle; furthermore, in these positions there is much less danger of an accident by getting the dose in the lungs. If animals are dosed standing or on their haunches, the nose should never be allowed to go above the eyes; otherwise the drench may pass down the windpipe into the lungs.

"By dosing sheep with water colored red and blue with dyeing material, and killing the animals immediately after the liquid was swallowed, the following results were obtained:

"If the dose was given with the sheep standing (1) almost the entire quantity went directly into the fourth stomach; if the sheep was placed on its haunches, the fluid passed in part into the fourth

stomach and in part into the first (the paunch); if the sheep was placed directly on its back (3), or if a steer was placed on its side (4) with head down, almost the entire dose passed into the first stomach (the paunch). If the animal, even when standing (1) struggled to a considerable degree, a portion of the fluid passed into the paunch.

"It will be immediately apparent that these facts are of practical importance in dosing. If, for instance, gasoline, turpentine, or creosote is used, *better results may be expected if the sheep is dosed standing.*"

The writer craves the indulgence of the reader for having devoted so much space to the question of treatment of parasites. It is indeed the most vital matter concerning the health of the sheep that will come to the shepherd for solution and a fore knowledge of systems of treatment when necessary may save great loss and much tribulation of spirit.

SPRING WASHING, SHEARING AND DIPPING.

When the writer was a boy, it was the almost universal custom to wash the wool upon the sheep's backs before they were shorn. A stirring time was this "sheep washing," and quite a picnic for the lads, the flock being penned in a close pen at the brook side at some point where the water was waist deep, and two men wading out seized the sheep as they were thrown to them and squeezed the wool with each hand to expel from it somewhat of the dirt and oil, then helped the sheep to climb up the opposite bank where they staggered off, astonished by the great weight of their own fleeces. They dried in a few days and then they were allowed to wait until the "oil rose again" after which they were shorn. This washing did not in anyway take the place of scouring to which the wool must be subjected after going to the manufacturers' hands, but merely made it somewhat lighter, so that it shrunk less after being bought. The only excuse for this washing is that the wool became slightly lighter before transported to market. However, buyers discriminated so much against the unwashed wool that it was really profitable to administer this farcial pretense of washing. In the writer's own country, washing has entirely gone out of practice and all wool is sold "in the dirt," which is as it should be, and doubtless another generation will see a total disappearance of the custom. Indeed if the flock is shorn as early as it should be, it will not be practicable to wash at all.

There may be locations, however, where the buyers will so discriminate against the unwashed, that it will still be profitable to run them through the creek. The dipping tank will serve for this purpose, if there can be provided a stream of water to flow constantly through it, otherwise the water would soon become so foul that the wool would be in worse condition than before. In Pennsylvania, as in other of the old states, various quaint customs still exist, and one of the quaintest that needs abandonment is the habit of tying sheeps' feet when shearing. This is not, of course, practiced by skilled shepherds anywhere save in the case of the black faced mountain sheep of Scotland, and is really a mark of ignorance of the shepherds, seeing that they will struggle far worse with their

feet tied than when they are free. The proper way to shear sheep either by hand or with the shearer is to let it rest naturally upon its rump or side with the neck thrown across the shepherd's knee as he kneels upon the ground and all of the feet completely off of the ground. The animal soon submits when it finds it cannot touch the ground with its feet, and patiently permits the wool to be cut away. As has been mentioned, it is desirable, wherever possible, that the shepherd should shear his own flock. Where this is not possible he should at least stand by and see that the wool is cut evenly and closely without second cuttings to shorten the fiber and make a veritable shoddy of a part of this new fleece, and that the sheep itself is not hacked and cut in an unnecessary manner. The fleece should be rolled together with the loose ends and flying locks in the center with all the dirty tags and chunks of manure thrown out, so that nothing goes into the fleece but wool, then roll it so that the outer ends of the fibers shall be in the center of the fleece. Tie only moderately tight, on a long flat box or table, using proper wool twine, and never under any circumstance using binder twine which greatly diminishes the value of the fleece. Not too many wraps of twine should be made either, seeing that it is a waste product to the buyer, and the profit by using an excess of twine is hardly sufficient to counterbalance the loss of character to the man who thus indulges his instinct for dishonesty. The reason why binder twine so injures the fleece is that small fibers of it entering the fabric refuse to take the dye stuffs, and must afterward be picked out by hand, a most slow and laborious proceeding. Honesty in preparing the fleece pays right well, seeing that a whole region sooner or later attains a reputation for honest wool or for the other thing, and prices will be governed in that region thereby.

Very early born lambs should be shorn in the spring if they are to be kept over and remain a permanent part of the flock, seeing that they will thrive better during summer for the removal of their fleeces. Use of the shearing machine in late spring or summer must be practiced with some care seeing that it may be made to cut so closely that the sheep is not protected against flies which readily bite the skin and cause great annoyance. It is not unlikely that ticks will be found upon the flock at shearing time, and if even a dozen are seen the shepherd may feel assured that there are more hidden upon the lambs, and as soon as the fleeces are removed, everything should go through the dip vat. This costs merely the labor and a trifle for dip, seeing that a very small quantity suffices after the fleeces are off the ewes will hardly require to drain at all at this time and they may be run through in a half day by the efforts of three or four men.

DOCKING AND CASTRATION.

Lambs that are surely to go to market in winter, fat from their mothers' sides, should be neither docked nor castrated. If there is any chance of their living for six months they should be both docked and castrated. Docking or cutting off the tail is a very simple operation and is usually performed after the lamb is a week old by a single stroke of the knife, or by the use of the chisel. It may bleed seriously, however, if cut close and the lamb is well bred and

full fed, in fact the writer has seen the best of lambs die from bleeding in this way.

There is a safer way, that is to cut off the tails with docking pinchers made of iron and heated to redness. These sever and sear the arteries at the same time and there is no bleeding at all. With the docking pinchers tails may be docked very close, which adds to the attractiveness of the lamb. These docking pinchers may be bought of sheep supply houses or made by the country smith; they ought to open three inches wide and be made with plenty of iron in them to hold heat. They should be rather blunt, at least not sharp enough to cut when cold. In using docking pinchers a board with a hole through it about 1 inch in diameter, or larger, if the lambs are old, is needed through which the tail is thrust when there is no danger of burning the lamb in the wrong place. After docking, pine tar may be smeared liberally over the stump to repel flies.

Castration of young lambs is a simple operation performed with small danger of loss. It should not be deferred longer than when the lamb is strong enough to endure the shock, say at ten days. The end of the scrotum is cut away and the testicles squeezed out, one at a time, and pulled clear out, cords and all, with the fingers. A little lard with which turpentine has been mixed, inserted in the opening, helps to deter the invasion of germs and healing rapidly follows.

Should old rams need castration, however, the use of the knife is almost surely fatal. Here the writer has used the docking pinchers with good success, having them very hot and taking off the entire scrotum with its contents. Six year old rams thus castrated have not missed a feed and have fattened readily. There is rarely any death loss following this manner of castration.

WINTER FEEDING OF WESTERN LAMBS.

The writer has for fourteen years practiced feeding lambs in winter that had been born the previous spring. It was originally his practice to buy native lambs, born in his own state or in some adjoining state, although for the last eight or ten years he has fed only lambs from western ranges. This lamb feeding is a trade of itself, and belongs especially to a country rich in grain and hay, having little pasture land. It has proved a profitable business with the writer, following it thus through a long term of years, although many men who have taken it up for one year or two and happened to strike seasons of low prices, have failed to make it pay. Like keeping sheep upon the farm, one must practice it steadily to get the most satisfactory results, seeing that experience costs money and once had, one should not throw it away. There is not the same degree of profit as a rule in fattening these lambs that there is in growing lambs and fattening them by their mother's side upon the farm, the one advantage being that all the crops and farm may be devoted to the lambs, whereas we have not yet learned to successfully keep in summer great numbers of ewes and lambs upon our rich arable soils without running across some of the stumbling blocks that have been indicated in previous pages. For instance, the writer has kept about 100 ewes upon his farm (sometimes nearly double this number) without diffi-

culty in keeping them healthy. But the farm itself, consisting of 320 acres, has been so enriched by a course of sheep farming and sheep feeding that it now provides food enough for 1,500 lambs during the winter months, in addition to the regular farm flock.

The feeding of lambs in winter time is a subject broad enough to deserve a special bulletin itself, but we will here briefly set down some of the rules, the following of which have brought success to us on Woodland Farm. First, we provide dry, well-aired barns where the lambs may shelter, and yet where they breathe air practically as pure as that out of doors. Next, we provide racks in which every lamb may find a place to eat at the same time so that no one has to wait for another. Third, we provide water **pure enough for human consumption** and in unlimited supply. Then we buy the small range lambs, getting them to weigh between 40 to 50 pounds in the Chicago market. We choose, where possible, those that have evidence of a mutton cross in them. Naturally these small lambs are born late in summer, else they would have been heavier and are therefore young when we begin to feed them—a point in their favor, seeing that the younger the baby the more food sticks to its ribs. We bring them home in October or November, and after they have rested a day or two on pasture and filled up somewhat and taken water, we dip them (unless they are already dipped at the stock yards before shipment to us) and place them at once in the barn, and give them from this time on, only dry forage with corn silage.

The next feeding of thirty days is of early cut alfalfa hay only, after which time they have sufficiently recovered their strength and tone so that their digestion is capable of taking care of other food. We then open the silo and begin the feeding of corn silage. This corn silage is made from well matured corn of varieties naturally ripening in our climate, planted no closer together than for the ordinary field crop and having on it an abundance of well ripened ears at the time it is cut. Corn silage and alfalfa hay continue to be without other grain until some time in January when they are gradually introduced to ear corn, broken at first into short lengths so as to be more easily shelled. This ear corn is slowly and steadily increased in volume until after thirty days they are consuming almost as much of it as they desire, it being our rule, however, never to feed quite as much as they would eat. Attached to the barns are small yards in which the lambs may run, the yards being dry and sheltered and at feeding times the lambs are all driven into the yards to be out of the way in the barn. They are thereafter permitted to run in and out as they please, although the writer feels that he is thus sacrificing quite a little of the fertility that they would accumulate if kept more constantly in the barn. In March they are shorn and in April or May they are sent to market weighing 85 to 90 pounds. It is notable that under the treatment indicated, which has from long practice become a habit with the writer's brothers and men upon the farm, the lambs ripen so uniformly that out of 1,000 sent to market in 1905, there were but seven that were sold at a different price from the rest, and but two that could in any way be termed "culls."

A few principles of management occurring to the writer as being important are, first, never to attempt to build up these small, half-

famished lambs with grain until they have become strong and hearty through consuming clover or alfalfa hay. Next, to make all changes in grain food very gradual, and never to reach quite the limit of their appetites. Then to feed with great regularity as to time of day, and lastly, to disturb the lambs as little as possible, for instance in the afternoons when they lie down to sleep, never to waken them under any pretext, treating them as you would any babies, with thoughtful and loving-kindness. The writer has not found it profitable to attempt to fatten these lambs with any other forage than clover or alfalfa hay, having found timothy hay, corn fodder and oat straw very unsuitable parts of the ration, and only useful where goodly quantities of wheat bran were fed in connection to provide the required protein.

DISEASES OF SHEEP.

The writer can almost say as was said in the famous essay upon snakes in Ireland, "There are no diseases of sheep," aside from infection from parasites. Tuberculosis among sheep is almost unknown. They will occasionally suffer from rheumatism, probably, and rams may be afflicted with gravel where overfed, upon sugar beets or mangels. There is an occasional instance of brain trouble aside from the parasites that encyst within the brain, but all of these things are of too difficult treatment and too infrequent occurrence to be given consideration here. As a matter of fact, a sick sheep, unless it have parasites that can be removed by treatment, is beyond human aid practically, at least, seeing that the cost of an expert veterinary would be greater than the value of the animal, and indeed the writer has found sickness aside from parasitic infection, the least of his troubles with the flock. There will always be a few that unaccountably die, and the probable cause in the writer's experience, has been overfeeding with grain. In the barns where lambs are fattening there will be a death loss of from two to four per cent. every winter, and this is most certainly due to indigestion, caused sometimes by the carelessness of attendants and sometimes is unavoidable. The shepherd must expect some disaster, but plan to keep it as low as possible. There is one misfortune that is worth some attention here and that is

SUMMER BLOATING UPON RAPE, CLOVER OR ALFALFA.

The inquiring reader may wonder why the sheep has so large a first stomach or paunch, and why it troubles to burden itself with so much hastily gathered forage, which later it regurgitates, raises again to the mouth and chews at its leisure, sending it onward to the lower stomachs where digestion mainly takes place. The reason of this must be sought in the nature of the sheep. It is a timid and helpless animal, forced to a life of caution, and compelled by instinct of self-preservation to hide itself upon inaccessible crags during the day, whence at evening it would emerge to the verdant slopes below and hastily snatch forage with which it could retreat. This food it would chew at its leisure in the safety of its retreat. In a state of nature the sheep found little very rich food, and ate mainly bulky food of only moderate nutrition. When introduced then to very rich pastures such as clover, alfalfa or rape, its instinct

does not teach it to eat with moderation, but it greedily packs the large paunch with the succulent stems and leaves which oftentimes soon set up a fermentation there causing an evolution of gases which may cause great inconvenience and distress to the sheep, or even result in death. Not every case of bloating kills the animal, since if the paunch is not too full the gas is belched up and no great harm ensues. Should it be overburdened, however, the pressure may throw a mass of food against the inlet, so that it is closed, and relief by belching is difficult or impossible and the continued creation of this gas may so distend the paunch as to rupture it or to prevent breathing by pressure upon the lungs. There are several simple remedies for mild cases that will prove availing; to hold up the head and keep the mouth open will assist the sheep to belch up gas, so that a stick or a cob thrust between the jaws and held there with the head elevated will be of service, and the shepherd should stand astride the ewe and press firmly but not violently against its distended sides with his knees, holding up the head, which will often give relief in a very few minutes. To administer by the mouth, lime water is helpful and a half pint of raw linseed oil in which is a teaspoonful of turpentine has proved efficient with some experimenters. Since heat causes the evolving of these gases, to pour on cold water upon the left side where the paunch reaches the surface will often relieve the suffering, if at the same time attention is given to cause as much gas to be belched up as possible.

The writer has often treated cows upon a ranch in Utah, by standing them with their heads up hill, clubs tied in their mouths and placing ice upon their distended sides, having never lost one. Sometimes, however, all of these expedients prove insufficient and recourse must be had to surgery. There is a spot on the left side about five inches from the spine where the paunch very closely approaches the skin, and here if a small incision be made the gas will escape. There must, however, be a small tube inserted and this kept clear of obstruction at the lower end else the pressure of food against it will cause the cessation of flow. If no trochar is at hand (one should always be upon a grazing farm, seeing that cattle as well as sheep may need it) a penknife will serve to make the incision, and a piece of reed fishing pole or any hollow stick inserted will permit the escape of gas. The operator must keep hold of the tube, however, else it will be drawn into the paunch where it will be impossible of extraction, the writer having thus imposed upon one ewe which curiously enough survived the barbarous operation, although just what she ever did with the pipe stem has been a mystery ever since, seeing that she could not raise it by regurgitation and neither could it pass on.

PASTURING OF CLOVER, ALFALFA AND RAPE.

There is a right and a wrong way of pasturing these bloating crops. The right way is to first permit them to reach a degree of maturity so that the clover or alfalfa are not far short of bloom before the sheep are turned in. There should also be sown among them brome grass, timothy or some other non-leguminous plant seeing that where a mixture of clover and grasses exists sheep will eat alternately one with the other and thus be much less subject

to bloat. The sheep should be thoroughly well filled up before being turned on to the clover, alfalfa or rape, being given chance to graze upon some especially succulent bit of grass, and perhaps fed a little grain before going upon the dangerous forage, the aim being to take away the edge of appetite so that they will not overeat when turned upon it. They should be turned in at about 10 o'clock in the morning at a time when being already filled with food and the sun become warm they would naturally prefer to go to the shade and rest rather than to graze any more at all. Then when they are once turned in they should have before them a receptacle containing salt and air slacked lime mixed, to which they may have access at all times, and they should never thereafter be turned out again night or day, rain or shine, while it is desired that they should run upon that pasture. To turn them in and out again allowing them to become hungry before having turned them back is almost a certain method of bringing trouble and loss, whereas, when they remain continually upon the dangerous forage they so frequently eat of it that they do not at any one time gorge themselves to repletion. Treated in this manner the writer has had remarkable success in depasturing alfalfa with sheep, some years having lost none at all and in other years from two to four per cent. only, but the survivors have been such fine specimens, as a result of the good and safe pasturage, that they much more than compensated for the death of a few. It is wise, however, in pasturing alfalfa with sheep, never to put upon the pasture a sufficient number to graze it down close, seeing that this invites two troubles, the destruction of the alfalfa and danger to the flock, causing the necessity of removing them for a time and placing them back after it has made a quick recovery and is composed of a mass of tender and easily fermentable stems and leaves.

THE ANGORA GOAT.

While not strictly belonging among a classification of breeds of sheep, it is felt wise here to say a few words concerning the Angora goat, which has lately claimed considerable attention among graziers having brushy pastures in our older states. Wonderful claims have been made for the Angora goat in point of profitableness, is having been emphasized that they will thrive with the least of care and upon brush alone, making of scrubby wood lots verdant pastures of rich green grass and returning in their fleeces and flesh great profit to their shepherds. The Angora is honestly deserving of great esteem and it is unnecessary to exaggerate its capabilities. It is not true that the Angora thrives upon brush alone, although it does from choice consume great quantities of leaves and sprouts, and will eat a very larger per cent. of such material than will sheep. It is, therefore, well fitted to be placed in companionship with sheep in especially brushy pastures. The Angora is not like the common goat, nor is it quite so hardy as the sheep, and is subject to precisely the same troubles and diseases that sheep are. It is more delicate when a kid than the sheep is when a lamb, and requires rather more skill in its treatment. One seldom succeeds in getting an increase of 100 per cent. with goats, whereas, an increase of 150 per cent. with the sheep is not unusual. The treatment of

goats should be quite similar to that given sheep as to dipping and keeping them free from both external and internal parasites. They especially need a shelter to which they can flee when storms approach, and this shelter should be kept dry and clean within. In summer time they will subsist well upon brush and a little grass. In winter they need attention and feeding of sound hay or corn fodder with chance to roam the brush lands again where they will do quite a little execution upon the smaller twigs. Their kids should not be born until the advent of grass in spring and there should be a yard provided with a style over which the mature goats may climb, and which the kids cannot pass, seeing that the defective instinct of the goat causes her to forget where she left her offspring, and thus, unless prevented, many kids will be lost. There are many Angoras in the United States of quite inferior quality of mohair, although there is one compensating advantage, that being, that the more admixture of common scrub goat, the greater the hardiness and ability to care for themselves. With good shepherding, however, there is no need to grow scrub goats, and even though the females may be somewhat inferior, the use of a high class sire will rapidly effect improvement in the quality of the fleeces. Angora Goats and sheep live quite peaceably in company and will not mix by interbreeding. There is probably no place for the Angora upon the arable farm, having no surplus of brush to subdue, but there are unquestionably millions of acres of mountain lands in Pennsylvania and adjoining states that might well support flocks of Angoras with good profit.

BUILDINGS.

In England buildings are seldom erected for the use of sheep, as they spend their entire lives out of doors; in our climate, however, some housing in winter time is necessary not only for the welfare of the sheep but for the preservation of the forage as well. There is no need for an expensive class of buildings for sheep housing, although any amount of money may of course be put into them if the owner so chooses, but as much profit will be secured from very simple buildings as from those more elaborate and costly. A few simple requisites should be borne in mind. First, that the barn have a basement, by which is not meant an underground apartment, but merely a lower story about eight feet in height, preferably all open in one large room, and with the north and south sides enclosed entirely by doors, these doors so divided horizontally that the upper half raises up as the lid of a chest raises, being hinged at its upper edge, while the lower half swings as an ordinary gate swings. By use of these doors the upper half may be opened slightly to permit a little air to enter and yet keep the storm out, or in close atmosphere it may be raised clear up to permit a free sweep of air through the building, while the lower half of the door restrains the sheep, thus one side may be opened largely while the other from which the storm may be coming may be closed entirely. It must be borne in mind always that sheep will not thrive unless they have a great abundance of fresh air. The upper portion of the barn will be devoted to the storage of hay, with chutes down which it may be thrown, and at one end a silo should be constructed of suitable size

to feed the numbers kept. This silo should not be too large, seeing that the entire surface to a depth of three or four inches should be fed off every day, although the greater the height, the better the economy. It is better not to inclose the sides of the basement with stone walls, although the end may be so enclosed, if it is desired, seeing that the entire length of both sides should be composed of doors. The racks for feeding may be very simple, consisting of low flat-bottomed troughs about 24 inches wide and as long as is convenient, with vertical slate nailed thereon and spaced 6 inches apart. In these simple racks hay and grain may be fed with satisfaction and economy, seeing that when the sheep can thrust their heads clear in between the slats, they will not draw out the hay and drop it upon the ground beneath their feet. These racks may be set in any convenient direction so as to afford division in the sheep barn. They should not be fixed in place. A drinking trough built of Portland cement and gravel, or crushed stone serves best, and it may be placed partly in the barn and partly in the yard. The yard adjoining the sheep barn should be concreted, or paved with stone or graveled with coarse gravel and kept clean and free from filth lest trouble from foot diseases may spread throughout the flock. The writer has just completed a barn intended entirely for the use of sheep, built substantially, yet of rough common lumber and unpainted at a cost of less than \$700, the dimensions being 32 feet wide by 72 feet long and 36 feet to the peak of the roof. This barn is intended to be devoted to fattening lambs and the writer has found that a floor space of about 6 feet to each lamb is sufficient, while twice that space will be sufficient for a ewe, although after lambing she will need a little more room.

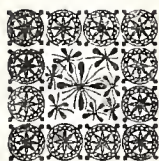
A LAST WORD.

The writer has taken particular pleasure in the preparation of this little bulletin, and has sought to embody in it only the directions and suggestions that have proved helpful in his own practice, cutting out all that seemed to him unessential, and dwelling at length upon some phases that may seem to the novice rather dreary reading. It is a forewarning of danger, however, that enables us to escape unhurt.

This thought the writer has ever tried to bear in mind. It has presented to him constantly a pleasing and hopeful picture as he has worked, to think of Pennsylvania farmers being devoted to sheep more than ever they have been, to see with the advent of the flocks that coming of a new life to the land, a ceasing of the drain of fertility upon the farm, and, instead, an increased upbuilding and indeed a new youth coming to the land, for with fertility abounding, life springs perennially from the soil and the oldest lands appear the newest where the dwellers thereon have been loving and wise. The writer observed this fact with ever growing delight in the hills of rural England, among the flocks of the southern counties, where it seemed to him all nature was younger, fresher and more beautiful than he had ever seen her before. All live stock serves to upbuild fertility, but sheep, most of all, since in pasture they better distribute their droppings, placing them especially upon the poor and higher parts of the field. Then their tiny feet do not tread the

ground into mud and trample out of existence the sod in winter time, but wherever they go the grass afterwards springs greener, sweeter and fresher than ever before. This is especially true when supplementary feeding is given. Upon the marvelous pastures of Great Britain, by feeding thereon the flocks with American "corn and cake," that is, with our maize and oil meal or oil cake, as that is the shape in which they mostly buy it, the great trans-Atlantic ships have taken to them the fatness of our land, leaving to us its bones, and carrying to those lands that we are wont to estimate as old, the perennial and smiling richness and fertility that should be our own.

There is another thought concerning the return of sheep to Pennsylvania farms, everywhere there is the complaint that young men desert the farms and that farm labor becomes steadily scarcer and less efficient. The writer believes that if these farms may be, by proper return to sheep husbandry, made more fertile and more profitable than they are to-day, not only will the sons of these farmers be kept at home, but labor finding more regular and better paid employment will be less inclined to wander to the smoke begrimed centers of industrial activity. It would seem to the writer that among the steadfast and patient farmers of Pennsylvania might be found a class of shepherds as ideal in character as any that can be developed in America, and to them with kindest wishes of success in their endeavor, the writer dedicates this little volume.



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By Mr. JOSEPH E. WING, Mechanicsburg, Ohio.



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